NASA

Aerospace Medicine and Biology
A Continuing Bibliography with Indexes

NASA SP-7011 (187)
December 1978

National Aeronautics and Space Administration

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ACCESSION NUMBER RANGES

Accession numbers cited in this Supplement fall within the following ranges:

STAR (N-10000 Series)	N78-30038 — N78-32035
IAA (A-10000 Series)	A78-46603 — A78-50238

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NASA SP-7011 (187)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 187)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in November 1978 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA).*

NASA Scientific and Technical Information Branch 1978
National Aeronautics and Space Administration
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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* (NASA SP-7011) lists 247 reports, articles and other documents announced during November 1978 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964; since that time, monthly supplements have been issued.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects of biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged in two major sections: *IAA Entries* and *STAR Entries*, in that order. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. This procedure, which saves time and money, accounts for the slight variation in citation appearances.

Two indexes -- subject and personal author -- are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1978 Supplements.

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All publications abstracted in this Section are available from the Technical Information Service, American Institute of Aeronautics and Astronautics, Inc. (AIAA), as follows: Paper copies of accessions are available at $6.00 per document up to a maximum of 20 pages. The charge for each additional page is $0.25. Microfiche[1] of documents announced in *IAA* are available at the rate of $2.50 per microfiche on demand, and at the rate of $1.10 per microfiche for standing orders for all *IAA* microfiche. The price for the *IAA* microfiche by category is available at the rate of $1.25 per microfiche plus a $1.00 service charge per category per issue. Microfiche of all the current AIAA Meeting Papers are available on a standing order basis at the rate of $1.35 per microfiche.

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TABLE OF CONTENTS

Page

IAA Entries (A78-10000) 257
STAR Entries (N78-10000) 275

Subject Index I-1
Personal Author Index I-27

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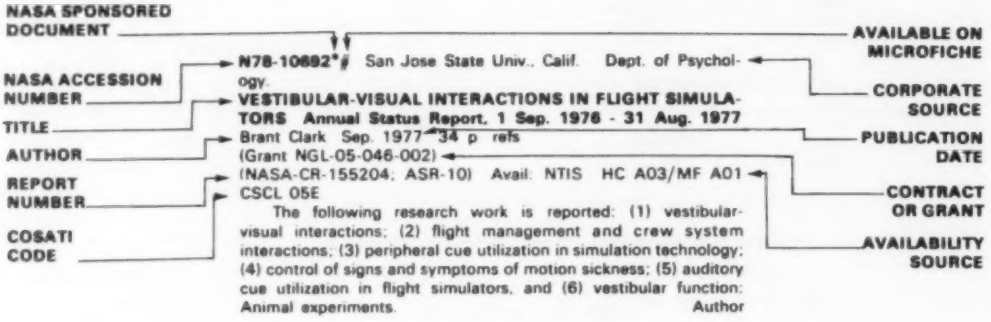
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N78-10682*# San Jose State Univ., Calif. Dept. of Psychology.
VESTIBULAR-VISUAL INTERACTIONS IN FLIGHT SIMULATORS Annual Status Report, 1 Sep. 1976 - 31 Aug. 1977
Brant Clark Sep. 1977 34 p refs
(Grant NGL-05-046-002)
(NASA-CR-155204; ASR-10) Avail: NTIS HC A03/MF A01
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The following research work is reported: (1) vestibular-visual interactions; (2) flight management and crew system interactions; (3) peripheral cue utilization in simulation technology; (4) control of signs and symptoms of motion sickness; (5) auditory cue utilization in flight simulators, and (6) vestibular function: Animal experiments.
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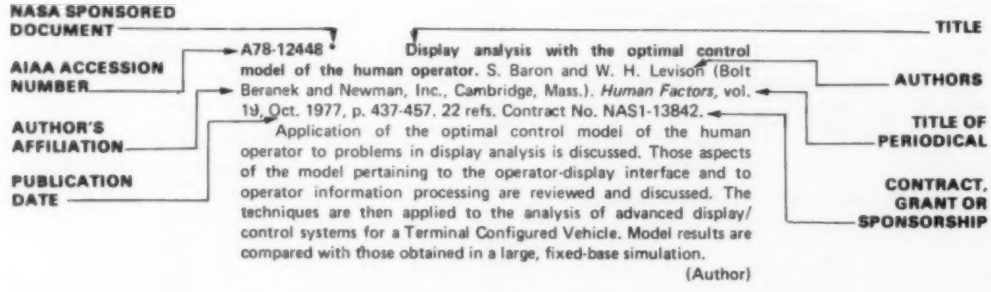
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A78-12448*
Display analysis with the optimal control model of the human operator. S. Baron and W. H. Levison (Bolt Beranek and Newman, Inc., Cambridge, Mass.). Human Factors, vol. 19, Oct. 1977, p. 437-457. 22 refs. Contract No. NAS1-13842.
Application of the optimal control model of the human operator to problems in display analysis is discussed. Those aspects of the model pertaining to the operator-display interface and to operator information processing are reviewed and discussed. The techniques are then applied to the analysis of advanced display/control systems for a Terminal Configured Vehicle. Model results are compared with those obtained in a large, fixed-base simulation.
(Author)

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl 187)

DECEMBER 1978

IAA ENTRIES

A78-46951 **Electric impedance and mechanical recording, cardiovascular investigative methods in air medicine (Impédance électrique et mécanographie, méthodes d'investigation cardiovasculaire en médecine aéronautique).** J. Colin, R. Carre (Armée de l'Air, Ecole d'Application; Centre de Recherches de Médecine Aéronautique, Paris, France), and R. Amoretti. *Médecine Aéronautique et Spatiale, Médecine Subaquatique et Hyperbare,* vol. 17, 1st Quarter, 1978, p. 13-20. 53 refs. In French.

Carotidography, a classical mechanical recording method, and plethysmography, an electric impedance method, are discussed. The advantages and disadvantages of these methods, particularly in air medicine, are examined, and their use in conjunction with EKG for the purpose of determining systolic intervals is explained. The use of the Kubicek formula modified by a correction factor and also a simpler formula for evaluating cardiac output is considered. M.L.

A78-46952 **Concorde and cosmic rays (Concorde et les rayons cosmiques).** J. Lavernhe, E. Lafontaine, and R. Laplane (Compagnie Nationale Air France, Paris, France). *Médecine Aéronautique et Spatiale, Médecine Subaquatique et Hyperbare,* vol. 17, 1st Quarter, 1978, p. 21-23. 5 refs. In French.

The amounts of cosmic ray irradiation received during Concorde flights between Paris and Rio de Janeiro, Caracas, and Washington were determined for the 2642 flight hours during 1976, and it was found that 1.49 mrem/hr were received during flights at high latitudes (Washington) and 0.78 mrem/hr were received at low altitudes (Rio de Janeiro, Caracas). The average value for the 772 flights was 0.99 mrem/hr. The maximum recommended amount of radiation to be received by the general public is 500 mrem/yr, and it is suggested that the radiation received during flight is minimal in comparison with this figure. M.L.

A78-46953 **Study of the specific effects of microwaves on the central nervous system. I - Demonstration of modifications of cerebral electrogenesis in the rat (Etude des effets spécifiques des hyperfréquences sur le système nerveux central. I - Mise en évidence de modifications de l'électrogenèse cérébrale du rat).** M. J. Klein and C. L. Milhaud (Centre de Recherches de Médecine Aéronautique, Paris, France). *Médecine Aéronautique et Spatiale, Médecine Subaquatique et Hyperbare,* vol. 17, 1st Quarter, 1978, p. 24-28. 21 refs. In French. Direction des Recherches et Moyens d'Essais Contracts No. 74/1147; No. 77/1001.

A78-46954 **Choice and analytic techniques involving indices of visual information input. I (Choix et techniques d'analyse d'indices de la prise d'informations visuelles. I).** M. Neboit (Organisme National de Sécurité Routière, Laboratoire de Psychologie Autodrome, Montlhéry, Essonne, France), J. P. Papin, A. Pottier, J. P. Puimean-Chieze, and D. Viard (Centre de Recherches de Médecine Aéronautique, Paris, France). *Médecine Aéronautique et Spatiale, Médecine Subaquatique et Hyperbare,* vol. 17, 1st Quarter, 1978, p. 29-31. In French.

An experimental device was used to determine the instruments pilots were observing during real and simulated flights. The device, worn on the head, has two separate optical channels ending, after transmission through an optical fiber, at a recording camera. One of the channels transmits the image of the visual field to the subject, while the other channel transmits a luminous arrow marker reflected by the cornea so that the arrow is superimposed on the spot of the visual field corresponding to the point being looked at. The frequency of examining each instrument, the amount and percentage of time at each instrument, and the frequency of shifting attention to different instruments were determined and serve as indices. The stability of individual strategies, the influence of flight phase, and other factors are considered. M.L.

A78-46955 **Deterioration of human performance resulting from mechanical vibrations (Dégradation de la performance humaine sous vibrations mécaniques).** J. L. Poirier and J. Beaugendre (Centre d'Essais en Vol, Laboratoire de Médecine Aérospatiale, Brétigny-sur-Orge, Essonne, France). *Médecine Aéronautique et Spatiale, Médecine Subaquatique et Hyperbare,* vol. 17, 1st Quarter, 1978, p. 32-35. 8 refs. In French.

The effect of 18 Hz sinusoidal frequency on human subjects was studied to gain information on the deterioration of pilot performance caused by helicopter vibrations. The sinusoidal frequency is along the x axis and has an effective acceleration of 0.4 g. Each experiment lasted 10 minutes and investigated a complex visual pursuit task involving recognition of light signals placed at the periphery of vision. It is found that the vibrations affect reaction time, but it is suggested that the experiment should be repeated with conditions modified to correspond more closely to actual flight conditions. M.L.

A78-46956 **Inquest after a civil aviation accident - Personal experience (Enquête après un accident aérien civil - Expérience personnelle).** F.-H. Zebouni (Middle East Airlines Airliban, Beirut, Lebanon). *Médecine Aéronautique et Spatiale, Médecine Subaquatique et Hyperbare,* vol. 17, 1st Quarter, 1978, p. 36-38. In French.

An airline's medical doctor describes the wreckage and the corpses that were produced by an explosion in a Boeing 720 B at 37,000 ft. The explosion occurred over Saudi Arabia on January 1, 1976 while the aircraft was on route from Beirut, Lebanon to Dubai and Muscat. Facial expressions, types of fractures, and histological data are reported. Features used to identify corpses are described; jaw fractures precluded identification by dental configuration. Lung tissue histology and the universal occurrence of clenched hands are interpreted as evidence that death occurred at high altitude as a result of sudden decompression. Gas chromatography later proved that a bomb had been stored in a suitcase. M.L.

A78-46957 **Contribution to the diagnosis of painless ischemic cardiopathy in flight personnel (Contribution au diagnostic de la cardiopathie ischemique indolore chez le personnel aéronavigant).** T. C. Popescu and I. Pintilie (Centre Médical Aéronautique,

Bucharest, Rumania). *Médecine Aéronautique et Spatiale, Médecine Subaquatique et Hyperbare*, vol. 17, 1st Quarter, 1978, p. 39-41. In French.

The ability to detect cardiac conditions by means of a complex EKG procedure is studied. EKGs were obtained during repose, in the 12 standard derivations, for periods of several minutes, in clinostatism, and in orthostatism. These examinations were administered in conjunction with the following challenges: hemodynamic (Flack and Valsava), reflex (eye compression and carotid sinus compression), pharmodynamic (amyl nitrite and atropine), hypoxia, pharmocologic (potassium chloride and glucose), and aerodynamic (hypobaric pressure and oxygen respiration at high intrapulmonary pressure). The procedure, besides being effective, is considered easy to administer. M.L.

A78-46958 Interrelation of psychosomatic troubles and psychoneurotic troubles in aeronautics (Interrelations des troubles psychosomatiques et des troubles psychonévrotiques en milieu aéronautique). B. Petrovic (Institut de Médecine Aéronautique, Belgrade, Yugoslavia). *Médecine Aéronautique et Spatiale, Médecine Subaquatique et Hyperbare*, vol. 17, 1st Quarter, 1978, p. 48-50. In French.

Psychosomatic and neurotic manifestations of the personality are considered, and it is suggested that the distinction between the two types of disorder is based on a fundamental distinction in subjects' personality structure and capacity for symbolic expression. Psychosomatic symptoms seem to appear more frequently among pilots than do neurotic symptoms. The occurrence of psychosomatic symptoms as opposed to neurotic symptoms is considered an encouraging sign for adaptation to a career in aviation. M.L.

A78-46959 Crises of maladaptation in confirmed pilots (Les crises de désadaptation chez l'aviateur confirmé). R. Gelly and M. Duffaut (Armée de l'Air, Centre Médical de Psychologie Clinique, Paris, France). *Médecine Aéronautique et Spatiale, Médecine Subaquatique et Hyperbare*, vol. 17, 1st Quarter, 1978, p. 51-55. In French.

Pilot psychopathology is said to manifest itself most frequently in the form of crises of socioprofessional maladaptation. The continuity between adaptation problems that occur during and after training is examined. Three kinds of problems are discussed: adaptive disability, hyperdefensive syndrome, and loss of object. M.L.

A78-46981 Adaptive cardiovascular changes to physical training in spontaneously hypertensive and normotensive rats. L. Weiss (Goteborg, Universitet, Goteborg, Sweden). *Cardiovascular Research*, vol. 12, June 1978, p. 329-333. 16 refs. Research supported by the Swedish National Association against Heart and Chest Diseases; Swedish Medical Research Council Grant No. 14X-00016.

A78-47110 Method of animal training for biosatellite. S. Sugimoto (Nagoya University, Nagoya, Japan). In: International Symposium on Space Technology and Science, 12th, Tokyo, Japan, May 16-20, 1977, Proceedings. Chofu, Tokyo, National Aerospace Laboratory, 1977, p. 797-801.

Experiments were conducted on male albino rats divided into stress-training and nontraining groups. The stress stimuli were cold, hypoxia, water immersion, restraint, and white noise; the parameters measured were corticosteron concentration in adrenal and serum, along with growth of mean body weight for each group and weight of relevant internal organs. The effect of +8 G acceleration for 15 min on circadian rhythm is assessed. All rats exposed to such a severe acceleration exhibited markedly high values of corticosteron in both adrenal and serum. The results suggest that hypoxia-stress training of animals is suitable for increasing their resistance to stress stimuli, while maintaining a normal circadian rhythm. S.D.

A78-47111 Microbiological study of bioecological system. I. H. Saiki, M. Nakaya, Y. Sugita, M. Sudoh, T. Okamoto, and J. Nakajima (Jikei University School of Medicine, Tokyo, Japan). In: International Symposium on Space Technology and Science, 12th, Tokyo, Japan, May 16-20, 1977, Proceedings. Chofu, Tokyo, National Aerospace Laboratory, 1977, p. 803-808. 6 refs.

The structure and functions of a new type of closed ecological apparatus with pure culture of algae are described. It is shown that the use of chlorella pyrenoidosa with no bacterial contamination and a CO2 concentration of 8-10 percent makes it possible to convert CO2 to O2 with very good efficiency, so that it is possible to produce a sufficient amount of O2 from CO2 exhaled from small animals such as rats. Bacterial contamination is found to be detrimental to CO2-to-O2 conversion. S.D.

A78-47112 Effects of partial body weightlessness on the vestibulo-ocular reflex in man. T. Mano (Hamamatsu University, Hamamatsu, Japan), T. Nishimura (Fujita-Gakuen University, Toyoake, Japan), S. Takagi, and G. Mitarai (Nagoya University, Nagoya, Japan). In: International Symposium on Space Technology and Science, 12th, Tokyo, Japan, May 16-20, 1977, Proceedings. Chofu, Tokyo, National Aerospace Laboratory, 1977, p. 809-814. 11 refs.

Experiments were conducted on eight healthy male subjects immersed gradually in a water tank in order to evaluate the effects of water immersion-simulated partial body weightlessness on the human vestibulo-ocular reflex by observing the electronystagmographic responses induced by caloric vestibular stimulation. Another objective was to determine proprioceptive influences on the vestibulo-ocular reflex in man. The results reveal that the vestibulo-ocular reflex is not inhibited but rather activated under partial weightlessness conditions, probably due to reduced inhibitory spinovestibular afferent inputs from antigravity muscles to the vestibular system. S.D.

A78-47113 Retinal hemorrhage in high mountain climbers. T. Asano and G. Mitarai (Nagoya University, Nagoya, Japan). In: International Symposium on Space Technology and Science, 12th, Tokyo, Japan, May 16-20, 1977, Proceedings. Chofu, Tokyo, National Aerospace Laboratory, 1977, p. 815-820. 17 refs.

Changes in the retinal fundus are examined in mountain climbers engaged in rapid ascent to high altitudes over 7000 m without oxygen supply, with occurrence of retinal hemorrhage. Preliminary hypobaric-chamber tests on the same subjects revealed similar changes in retinal vessels, but no hemorrhage. The results suggest that sudden increase in retinal venous pressure accompanied by vomiting, coughing and physical exertion of climbing is the principal cause for the hemorrhage under the vulnerable condition of vasodilation and increased capillary permeability due to hypoxia. S.D.

A78-47206 * Elasticity of excised dog lung parenchyma. D. L. Vawter, Y. C. Fung, and J. B. West (California, University, La Jolla, Calif.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 45, Aug. 1978, p. 261-269. 26 refs. NSF Grant No. ENG-75-19401; Grants No. NGL-05-009-109; No. NIH-HL-17731; No. NIH-HL-12494.

An optical-electromechanical system is used to measure the force-deformation behavior of biaxially loaded rectangular slabs of excised dog lung parenchyma. In the course of the study, the effects of time, the consistency of reference lengths and areas, the presence of hysteresis, the necessity of preconditioning, the repeatability of results, the effects of lateral load, the effect of strain rate, the effect of pH, the influence of temperature, and the variations among specimens are considered. A new finding is that there is a change in elastic behavior when the tissue undergoes a compressive strain. When the tissue is in tension, increasing the lateral load decreases the compliance, whereas the opposite is true when compressive strain is present. S.D.

A78-47207 Influence of posture on isometric fatigue. A. R. Lind, R. Burse, R. H. Rochelle, J. S. Rinehart, and J. S. Petrofsky (St. Louis University, St. Louis, Mo.). *Journal of Applied*

Physiology: Respiratory, Environmental and Exercise Physiology, vol. 45, Aug. 1978, p. 270-274. 13 refs. Grant No. AF-AFOSR-72-2362.

Handgrip isometric contraction experiments are conducted on four volunteer healthy men aged 25-37 yr in order to assess the influence of posture on muscular strength and endurance along with the associated cardiovascular changes. Although the study applies to any working situation, emphasis is placed on illustrating the influence of postural changes on isometric muscular exercise with reference to pilots of high-performance aircraft. An accurate hand dynamometer is used while the subjects perform the isometric exercise (1) while seated; (or in three positions on a tilt table) (2) 45 deg head-up; (3) recumbent; and (4) 15 deg head-down. It is found that the isometric strength remains unchanged by modifications in posture, and that isometric endurance is greater in the sitting than in the recumbent posture. Results on the blood flow through the forearm suggest that the low-pressure baroreceptors are not responsible for the differences in blood flow during exercise. S.D.

A78-47208 CSF pH and ventilatory acclimatization to altitude. R. D. Crawford and J. W. Severinghaus (California, University, San Francisco, Calif.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 45, Aug. 1978, p. 275-283. 32 refs. Grants No. PHS-HL-06285; No. PHS-GM-15571.

Experiments were carried out on four healthy male subjects to determine CSF pH at sea level and altitude, the latter after 45 min of acute normalization of P(O2) to sea-level values. At both altitudes, immediately after the normoxic sample, the effect on CSF pH of 45-min hypoxia at the normoxic P(CO2) was assessed. This was done to evaluate the maximum alkaline shift of CSF pH which could be due to hypoxic spinal cord vasodilation. Ventilatory responses to hypoxia and CO2 were determined along with their interaction at both altitudes to permit calculation of the partial contributions of central and peripheral chemoreceptors at altitude. It is shown that the alkalinity of lumbar CFS in subjects acclimatized at altitude is eliminated by acute normoxia, primarily due to peripheral chemoreceptor drive. Medullary and peripheral chemoreceptor sensitivities are unaltered by acclimatization. A hypothetical medullary chemoreceptor pH-ventilation diagram is discussed. S.D.

A78-47209 Variability of oxygen affinity of normal blood - An automated method of measurement. R. M. Winslow, J. M. Morrissey, R. L. Berger, P. D. Smith, and C. C. Gibson (National Institutes of Health, National Heart, Lung and Blood Institute, Bethesda, Md.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 45, Aug. 1978, p. 289-297. 20 refs.

Oxygen equilibrium curves of 48 healthy adult subjects have been measured by the method of Rossi-Bernardi et al. 1975), in which H2O2 is gradually added to a sample of deoxygenated blood that contains an excess of catalase. The mean P-50 for nonsmokers was 26.9 torr and the distribution of values was slightly skewed to the right (range 24.2-29.9 torr). The method differs from others previously available in that pH, P(CO2) and HCO3(-) are constant during oxygenation. The system for control of the experiment and data collection and processing has been automated by the use of a microprocessor so that the equilibrium curve can be obtained quickly, reproducibly, and relatively simply. With the aid of a digital computer, the parameters of the generalized Adair equation can also be estimated. (Author)

A78-47210 Cerebral energy state during or after hypoxia and complete or incomplete ischemia. G. Benzi, E. Arrigoni, F. Dagani, O. Pastoris, R. F. Villa, and A. Agnoli (Pavia, Università, Pavia; L'Aquila, Università, L'Aquila, Italy). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 45, Aug. 1978, p. 312-319. 37 refs.

Experiments were performed to evaluate the behavior of pertinent biochemical parameters in the cerebral cortex of the motor area of beagle dogs (aged 1.5 yr and weighing 10.6-13.8 kg) in hypovolemic hypotension, during and after hypoxemia, whether complicated or not by incomplete or complete ischemia. A comparative examination of the various conditions reveals that the most drastic fall in the cerebral energy occurs during hypoxia plus complete ischemia followed, in order, by hypoxia plus incomplete ischemia and simple hypoxia. The various forms of hypoxia cause changes in brain metabolism, related to energy transduction, which may be regarded as the specific consequence of differentiated effects on enzymatic activity and on modulation and automodulation mechanisms that make the neuron a functionally integrated system. S.D.

A78-47482 # Man under conditions of weightlessness (Człowiek w niewazkosci). J. Domaszuk. *Astronautyka*, vol. 21, no. 4, 1978, p. 11-15. In Polish.

The experience obtained during Apollo and other prolonged space flights, concerning the physiological and medical aspects of the influence of weightlessness on the human organism is reviewed. The mechanism of system disturbances caused by weightlessness is discussed, and a block diagram of the mechanism is proposed. The reactions of adaptation of the human system to weightlessness are schematized. V.P.

A78-47484 # Sensory deprivation as a problem of prolonged space flights ('Głod zmysłow' jako problem długotrwalych lotow kosmicznych). J. Terelak. *Astronautyka*, vol. 21, no. 4, 1978, p. 20-22. In Polish.

The paper reviews the results of deprivation studies - both in the laboratory and in the winter Antarctica - carried out with normal test subjects and in the course of astronaut training. Some psychological approaches to the determination of the psychological mechanisms associated with the functioning of man under conditions of deprivation and isolation are examined, and certain means of providing stimuli during prolonged space flights are noted. V.P.

A78-47491 Objective workload and behavioural response in airport radar control rooms. M. W. Hurst and R. M. Rose (Boston University, Boston, Mass.). *Ergonomics*, vol. 21, July 1978, p. 559-565. U.S. Department of Transportation Contract No. FA73WA-3211.

Results are presented for a study designed to investigate whether peak traffic counts and the duration of radio communications are behavioral stressors in radar control rooms which provide local radar control at airports. A number of other objective workload measures are evaluated which are particular to radar control rooms but which are not part of the work environment pertaining to the general air route traffic control center. The results clearly replicate previous findings that peak traffic and duration of radio communication tasks are significantly correlated with behavioral responses in the ATC work environment. Two unique findings of the present study are that time spent monitoring and on stand-by are behavioral stressors. S.D.

A78-47492 An assessment of a N2O rebreathing method for the estimation of cardiac output during severe exercise. E. ZeidiFard and C. T. M. Davies (Medical Research Council, Environmental Physiology Unit, London, England). *Ergonomics*, vol. 21, July 1978, p. 567-572. 13 refs.

Cardiac output was measured as pulmonary blood flow by a noninvasive N2O rebreathing technique during exercise at submaximal and maximal work levels in three subjects. The standard deviation of repeated measurements over a period of 6-20 weeks was + or - 1.51 per min at all levels of work and in all subjects. This level of variability is comparable to that found in using the dye dilution and direct (O2) Fick methods in individual subjects during a more limited time span, and suggests that the method can be used effectively in unsteady state and maximal conditions of dynamic exercise. (Author)

A78-47541 # Control of a flexible manipulator arm (Regelung eines flexiblen Manipulatorarms). A. Truckenbrodt (Munchen, Technische Universität, Munich, West Germany). *(Gesellschaft für angewandte Mathematik und Mechanik, Wissenschaftliche Jahrestagung, Lyngby, Denmark, May 31-June 3, 1977.) Zeitschrift für angewandte Mathematik und Mechanik*, vol. 58, June 1978, p. T 184, T 185. In German.

Equations of motion and a control procedure are derived for a manipulator arm system. An elastic arm without inner damping is moved by force applied at a shoulder joint, and the movement of a hand, at the opposite end of the arm, is controlled by means of a grip tongs. A hybrid many-body model, involving fixed-body and elastic coordinates, is introduced, and the equations for determining the angles at the 'shoulder' and the 'elbow' are presented. The amelioration of negative effects associated with elastic arm motion is considered. M.L.

A78-47667 * Methane-producing bacteria - Natural fractionations of the stable carbon isotopes. L. M. Games, J. M. Hayes (Indiana University, Bloomington, Ind.), and R. P. Gunsalus (Illinois, University, Urbana, Ill.). *Geochimica et Cosmochimica Acta*, vol. 42, Aug. 1978, p. 1295-1297. 23 refs. NSF Grant No. GB-37826X; Grant No. NGR-15-003-118.

Procedures for determining the C-13/C-12 fractionation factors for methane-producing bacteria are described, and the fractionation factors (CO2/CH4) for the reduction of CO2 to CH4 by pure cultures are 1.045 for Methanosarcina barkeri at 40 C, 1.061 for Methanobacterium strain M.o.H. at 40 C, and 1.025 for Methanobacterium thermoautotrophicum at 65 C. The data are consistent with the field determinations if fractionation by acetate dissimilation approximates fractionations observed in natural environments. In other words, the acetic acid used by acetate dissimilating bacteria, if they play an important role in natural methane production, must have an intramolecular isotopic fractionation (CO2H/CH3) approximating the observed CO2/CH4 fractionation. M.L.

A78-47845 Chemical evolution and the origin of life. R. E. Dickerson (California Institute of Technology, Pasadena, Calif.). *Scientific American*, vol. 239, Sept. 1978, p. 70-86.

Theories on the origin of life are reviewed, and the synthesis of chemical compounds essential for life is discussed. The reasons for assuming that life originated in a reducing atmosphere are explained. Element abundances and sources of energy for chemical synthesis are considered. Pathways are proposed for the synthesis of amino acids, ribose, adenine, ATP, and polymers. The possiblilities offered by photosynthesis are explored, coacervate studies are surveyed, and the significance of stereoisomers is considered. M.L.

A78-47846 The evolution of the earliest cells. J. W. Schopf (California, University, Los Angeles, Calif.). *Scientific American*, vol. 239, Sept. 1978, p. 110-112, 114, 116-120 (10 ff.).

Prokaryotes and eukaryotes are distinguished, and the evolution of eukaryotic algae and prokaryotic heterotrophic bacteria, photosynthetic bacteria, and cyanobacteria is discussed. The importance of solar energy, oceanic compounds, and atmospheric characteristics (the amount of oxygen in particular) is considered. The effects of oxygen concentration on nitrogen fixation and on the biosynthesis of sterols and fatty acids are examined. The interpretation of fossils is discussed, and fossil evidence for a proposed sequence of evolution of primitive cells is described. M.L.

A78-47888 * Genetic code correlations - Amino acids and their anticodon nucleotides. A. L. Weber and J. C. Lacey, Jr. (Alabama, University, Birmingham, Ala.). *Journal of Molecular Evolution*, vol. 11, Aug. 2, 1978, p. 199-210. 25 refs. Grant No. NGR-01-010-001.

The data here show direct correlations between both the hydrophobicity and the hydrophilicity of the homocodonic amino acids and their anticodon nucleotides. While the differences between properties of uracil and cytosine derivatives are small, further data show that uracil has an affinity for charged species. Although these data suggest that molecular relationships between amino acids and anticodons were responsible for the origin of the code, it is not clear what the mechanism of the origin might have been. (Author)

A78-47889 The genetic code as a periodic table. J. R. Jungck (Clarkson College, Potsdam, N.Y.). *Journal of Molecular Evolution*, vol. 11, Aug. 2, 1978, p. 211-224. 34 refs.

The contemporary genetic code is reflective of a significant correlation between the properties of amino acids and their anticodons in a periodic manner. Almost all properties of amino acids showed a greater correlation to anticodonic than to codonic dinucleoside monophosphate properties. The polarity and bulkiness of amino acid side chains can be used to predict the anticodon with considerable confidence. The results are most consistent with predictions of the 'direct interaction' and 'ambiguity reduction' hypotheses for the origin of the genetic code. (Author)

A78-47890 * A measure of the denseness of a phylogenetic network. R. Holmquist (California, University, Berkeley, Calif.). *Journal of Molecular Evolution*, vol. 11, Aug. 2, 1978, p. 225-231. 7 refs. NASA-supported research; NSF Grant No. PCM-76-18627.

An objective measure of phylogenetic denseness is developed to examine various phylogenetic criteria: alpha- and beta-hemoglobin, myoglobin, cytochrome c, and the parvalbumin family. Attention is given to the number of nucleotide replacements separating homologous sequences, and to the topology of the network (in other words, to the qualitative nature of the network as defined by how closely the studied species are related). Applications include quantitative comparisons of species origin, relation, and rates of evolution. D.M.W.

A78-47891 Archaebacteria. C. R. Woese, L. J. Magrum (Illinois, University, Urbana, Ill.), and G. E. Fox (Houston, University, Houston, Tex.). *Journal of Molecular Evolution*, vol. 11, Aug. 2, 1978, p. 245-252. 46 refs.

Archaebacteria are differentiated from eubacteria on the basis of the following characteristics: the presence of characteristic t- and r-RNAs, the absence of peptoglycan cell walls and their possible replacement by a proteinaceous coat, ether-linked lipids from phytanyl chains, and occurrence in unusual habitats, e.g., methane, halide, and thermoacidic environments. Attention is given to the classification of archaebacteria in terms of a separate line of descent, i.e., convergent evolution with classical bacteria. D.M.W.

A78-47892 * Phytanyl-glycerol ethers and squalenes in the archaebacterium Methanobacterium thermoautotrophicum. T. G. Tornabene (Colorado State University, Fort Collins, Colo.), R. S. Wolfe, W. E. Balch (Illinois, University, Urbana, Ill.), G. Holzer, G. E. Fox, and J. Oro (Houston, University, Houston, Tex.). *Journal of Molecular Evolution*, vol. 11, Aug. 2, 1978, p. 259-266. 34 refs. Grants No. NGR-44-005-002; No. PHS-AI-12277; Contract No. EE-77-S-02-4478.

Gas chromatographic and mass- and infrared-spectrometric techniques are used to assay the lipids of a thermophilic chemolithotroph, Methanobacterium thermoautotrophicum. Of the chloroform-soluble lipids, 79% are polar and 21% non-polar. Attention is given to the detection of squalene and hydrosqualene derivatives, which, coupled with 16S r-RNA sequence homologies, indicate that the extreme halophiles and the methanogens share a common ancestor. D.M.W.

A78-47893 * Neutral changes during divergent evolution of hemoglobins. T. H. Jukes (California, University, Berkeley, Calif.). *Journal of Molecular Evolution*, vol. 11, Aug. 2, 1978, p. 267-269. 7 refs. Grant No. NGR-05-003-460.

A comparison of the mRNAs for rabbit and human beta-hemoglobins shows that synonymous changes in codons have accumulated three times as rapidly as nucleotide replacements that produced changes in amino acids. This agrees with predictions based

on the so-called neutral theory. In addition, seven codon changes that appear to be single-base changes (according to maximum parsimony) are actually two-base changes. This indicates that the construction of primordial sequences is of limited significance when based on inferences that assume minimum base changes for amino acid replacements. (Author)

A78-47949 Substrate effects on myocardial performance during normoxia and hypoxia. T. R. Snow (Duke University, Durham, N.C.). *American Journal of Physiology*, vol. 235, Aug. 1978, p. H144-H149. 34 refs. Grants No. NIH-HL-17391; No. NIH-HL-19216.

Experiments were conducted on the papillary muscle of the right ventricle in female rabbits (2-3 kg) with a view toward comparing changes in the intramitochondrial NADH fluorescence with changes in the rate of mechanical energy expenditure for two substrates, glucose and butyric acid, under normoxic and hypoxic conditions. Using the relation between the change in NADH fluorescence and mechanical-work rate, the dynamic response of the myocardium as a function of substrate was determined. The results indicate that glucose may be a more efficient substrate than butyrate, which may explain its beneficial effect on the challenged myocardium. The difference between glucose and butyrate in response to hypoxia may be attributed to support of ATP levels by anaerobic metabolism of glucose. Following reoxygenation, mechanical performance is recovered with glucose but not with butyrate. S.D.

A78-47951 Characteristics of cosmonaut activities during flight (Osobennosti deiatel'nosti kosmonavta v polete). Edited by B. F. Lomov, A. G. Nikolaev, and L. S. Khachatur'iants. Moscow, Izdatel'stvo Mashinostroenie, 1976. 272 p. 221 refs. In Russian.

A collection of papers is presented regarding general problems of investigation of an astronaut's activity, methods of evaluating this activity, dynamic characteristics of the motor communication channel of the astronaut operator, and the state of the visual communication channel. Attention is given to changes in the reliability characteristics of the astronaut's activity under a set of space-flight effects. The material presented allows the analysis various aspects of the astronaut's activity along with the operation of onboard control systems during actual flights and ground-based tests. S.D.

A78-47953 # Adaptational fluctuations in the initial state of space flight (Adaptatsionnye fliuktuatsii pervykh vitkov kosmicheskogo poleta). L. S. Khachatur'iants. In: Characteristics of cosmonaut activities during flight. Moscow, Izdatel'stvo Mashinostroenie, 1976, p. 12-21. In Russian.

Changes in the psychophysiological functions of astronauts in the initial stage of space flight are discussed, with particular reference to disorders in motor skills, cerebral circulation, the vestibular system, and performance time of flight tasks. Attention is given to means of activating a rapid adaptation to space flight conditions and to reducing the psychophysiological variations due to the transition from ground to space conditions. Measures necessary to stabilize the astronaut's work capacity in the initial stage of space flight are mentioned, including the determination of additional psychological and engineering requirements of the equipment to be used during this initial stage. S.D.

A78-47955 # Pilot training and prognosis of psychophysiological conditioning of astronauts (Letnaia podgotovka i prognozirovanie psikhofiziologicheskoi natrenirovannosti kosmonavta). V. P. Zaval'niuk, A. V. Eremin, and V. N. Trofimov. In: Characteristics of cosmonaut activities during flight. Moscow, Izdatel'stvo Mashinostroenie, 1976, p. 32-34. In Russian.

A78-47956 # Medical problems of rationalizing the work-rest regimen of astronauts (Meditsinskie problemy ratsionalizatsii rezhima truda i otdykha kosmonavtov). V. A. Bodrov. In: Characteristics of cosmonaut activities during flight. Moscow, Izdatel'stvo Mashinostroenie, 1976, p. 34-45. In Russian.

Experimental data are analyzed to reveal the impairment of physiological, psychological, and hormonal functions related to the circadian rhythm of astronauts during space flight. The reasons for which it is impossible to adopt a ground-based circadian rhythm during space flight are the absence of biological rhythm time sensors in the spacecraft cabin (alternation of day and night, diurnal fluctuations of the environment, etc.), displacement of the diurnal cycle during flight, necessity of having someone on duty around the clock, restrained muscular activity, and other causes. The complexity of developing a rational work-rest regimen is discussed in terms of creating and maintaining a predetermined wakefulness-sleep rhythm with appropriate allocation of rest time in the spacecraft. S.D.

A78-47957 # Information processing under emotionally saturated conditions of activity (Pererabotka informatsii v emotsional'no nasyshchennykh usloviiakh deiatel'nosti). A. N. Litsov and I. F. Saraev. In: Characteristics of cosmonaut activities during flight. Moscow, Izdatel'stvo Mashinostroenie, 1976, p. 45-49. In Russian.

The paper analyzes the results of experiments on information processing by a human operator as a function of emotional-stress level in experienced and inexperienced parachutists jumping from an aircraft. The experiments are performed a day before jumping, in the morning of the jumping day, in the aircraft, and after landing. The information processing rate is evaluated in terms of simple reaction time, selective reaction time between two options, solution of test tasks, and reaction time to a moving object. The results indicate that the emotional stress arising in extremal conditions of work may significantly reduce the information processing rate, thereby affecting the reliability and effectiveness of a human operator's work. S.D.

A78-47958 # Psychological model of weightlessness in space flight simulation (Psikhicheskaia model' nevesomosti pri modelirovanii kosmicheskogo poleta). L. P. Grimak and L. S. Khachatur'iants. In: Characteristics of cosmonaut activities during flight. Moscow, Izdatel'stvo Mashinostroenie, 1976, p. 49-58. In Russian.

Experiments were carried out on individuals subjected to hypnotic suggestion of reduced gravity. The objective was to assess the posthypnotic behavior of the test subjects, under simulated space flight work-rest conditions, in terms of physiological, psychological, and biomechanical changes caused by the sensation of reduced gravity induced during hypnosis. The subjective report of the test subject, following reduced-gravity sensation of weighing 5-6 kg, was that he actually felt an unusually pleasant state of lightness during the posthypnotic period, along with psychophysiological and motor-coordinative changes which are almost the same as those occurring in real weightlessness conditions. The results confirm the possibility of using a psychological model of reduced gravity based on hypnotic suggestion of reduced gravity in order to simulate reduced-gravity conditions in ground-based experiments. S.D.

A78-47959 # Justification of the use of artificial gravity in space flight (Obosnovanie iskusstvennoi sily tiazhesti v kosmicheskom polete). G. F. Makarov. In: Characteristics of cosmonaut activities during flight. Moscow, Izdatel'stvo Mashinostroenie, 1976, p. 58-62. In Russian.

The suitability of applying a reduced artificial gravity in a spacecraft is examined experimentally. It is shown that the most economical expenditure of energy is achieved with a reduced gravity between 0.18 and 0.14 g. In particular, such a condition corresponds to an optimal combination of minimum artificial gravity and maintainance of the astronaut's work capacity on a level assuring maximum energy saving with sufficient normalization of a number of physiological functions of the human organism. S.D.

A78-47960 # **Emotional state and orthostatic reactions (Psikhicheskie sostoianiia i ortostaticheskie reaktsii).** L. P. Grimak and V. G. Voloshin. In: Characteristics of cosmonaut activities during flight. Moscow, Izdatel'stvo Mashinostroenie, 1976, p. 62-69. In Russian.

Passive orthostatic reactions are experimentally examined on absolutely normal subjects in the deepest stage of hypnosis characterized by stable phase state of the cerebral cortex. Verbal suggestion is used to create the following physical and pertinent emotional states: sensation of strictly horizontal posture of the body, sensation of strictly horizontal posture of the body with maximum possible muscle relaxation, relaxation of postural muscles induced by 'gravitational hypostatis'. The discussion elucidates the influence, on orthostatic reactions, of various nodes of the neural regulation network (beginning from the cortical centers), of the emotional state, and of the muscle tone. S.D.

A78-47961 # **Suggestibility and characterological features of personality (Vnushaemost' i kharakterologicheskie osobennosti lichnosti).** L. P. Grimak and V. F. Volokhov. In: Characteristics of cosmonaut activities during flight. Moscow, Izdatel'stvo Mashinostroenie, 1976, p. 69-73. In Russian.

A comprehensive experimental study is made of the individual psychological features of test subjects with a high degree suggestibility (susceptibility to hypnosis) and a low degree of perceptivity to verbal suggestion. The experimental data obtained reveal a strong correlation between suggestibility and such characterological features of personality as social adaptability in small groups, intercommunication ability, capacity to develop stable psychological sets, prevalence of mental image formation, increased anxiety, and other personality features. The results may contribute to a more effective solution of problems of psychological compatibility during professional selection of small groups. S.D.

A78-47962 # **Method of evaluating the work capacity of pilots and astronauts (Metodika otsenki rabotosposobnosti letchikov i kosmonavtov).** V. G. Volkov, E. A. Ivanov, and N. N. Lebedeva. In: Characteristics of cosmonaut activities during flight. Moscow, Izdatel'stvo Mashinostroenie, 1976, p. 74-79. In Russian.

A method of estimating the work capacity of pilots and astronauts by means of an electronic tracking recorder is described. The device is designed to test for pursuit tracking in three situations: uniform motion of a given point along the circumference, operation with time lag in the control circuit, and sinusoidal motion of the target. Tracking error is determined by the magnitude of disagreement related to the noncoincidence of the sight with the target. A formula is derived for calculating the resulting tracking error. A major advantage of the electronic tracking recorder is that it allows evaluation of current work capacity along with the study of some psychophysiological mechanisms responsible for the operator's performance. S.D.

A78-47963 # **Method of investigating perceptual extrapolation (Metodika issledovaniia pertseptivnoi ekstrapoliatsii).** Iu. B. Pikovskii, V. A. Popov, and L. S. Khachatur'iants. In: Characteristics of cosmonaut activities during flight. Moscow, Izdatel'stvo Mashinostroenie, 1976, p. 79-84. In Russian.

The activity of a human operator in space flight is assessed by measuring the rate of human motor response as a function of the complexity and the degree of uncertainty of the information program consisting of light stimuli of different colors presented discretely in predetermined successions. It is shown that the degree of stability of the motor responses is individually dependent on the noise related to the perceptive extrapolation of the programmed stimuli. More importantly, perceptive extrapolation becomes more impaired, the more complex is the structure of the code for the incoming sensory stimuli. S.D.

A78-47964 # **Radio telegraphy as a realistic test for investigating an astronaut's activity (Radiotelegrafiia kak rabochii test issledovaniia deiatel'nosti kosmonavta).** L. S. Khachatur'iants, N. V. Krylova, and V. I. Metlik. In: Characteristics of cosmonaut activities during flight. Moscow, Izdatel'stvo Mashinostroenie, 1976, p. 84-89. In Russian.

A realistic test is understood to mean a method that involves elements of real activity of astronauts. Information transmission radio telegraphy is used as a testing method for the psychophysiological evaluation of the finely coordinated purposeful performance of an astronaut during space flight. A criterion of performance quality is presented for evaluating the quality of signal transmission by radio telegraphy. It is shown that the described realistic test is a sufficiently sensitive indicator of the finely coordinated activity of the astronaut. S.D.

A78-47965 # **Biological model of a self-adjusting filter (Biologicheskaia model' samonastraivaiushchego fil'tra).** L. P. Grimak, S. V. Kiselev, V. L. Monin, and V. V. Petrusinskii. In: Characteristics of cosmonaut activities during flight. Moscow, Izdatel'stvo Mashinostroenie, 1976, p. 89-94. In Russian.

The paper discusses the development of a self-learning system of pattern recognition, where learning is achieved through simultaneous presentation of the current values of all electrophysiological parameters with indication of the state being realized at a given time. This problem is reduced to the construction of a self-adjusting filter designed to suppress noise and increase SNR. Presentation of information is performed on an analog basis in order to make the system more sensitive though less stable. The central nervous system is proposed as an analog self-adjusting filter, and its characteristics are described. Emphasis is placed on the use of a second test subject who operates as an adapter having the property of adapting himself to the constant component of the stimulus and reacting only to its variable component. S.D.

A78-47968 # **The astronaut in the astronavigation system of manned spacecraft (Kosmonavt v sisteme astronavigatsii pilotiruemogo kosmicheskogo korablia).** E. V. Khrunov, N. F. Romanteev, V. V. Shevchenko, and A. V. Bukhonkin. In: Characteristics of cosmonaut activities during flight. Moscow, Izdatel'stvo Mashinostroenie, 1976, p. 107-121. In Russian.

The paper stresses that a reliable onboard autonomous navigation is necessary for successful manned space flight. Autonomous navigation is understood to mean the complex of manned spacecraft crew operations in determining the navigation elements and supplying to the control system the necessary signals ensuring that the spacecraft moves toward a predetermined point in space along a prescribed trajectory and in the calculated time. Methods of effective orientation and navigation during daytime and nighttime are also discussed. Successful performance of a human operator in space depends greatly on his training level. S.D.

A78-47969 # **Operator activity in a state of continuous wakefulness (Operatorskaia deiatel'nost' v usloviiakh nepreryvnogo bodrstvovaniia).** V. P. Stupnitskii, V. V. Pozdniakov, V. N. Trofimov, R. B. Bogdashevskii, and O. N. Kuznetsov. In: Characteristics of cosmonaut activities during flight. Moscow, Izdatel'stvo Mashinostroenie, 1976, p. 121-127. In Russian.

Astronauts in space flight may encounter situations where they would be forced to perform control and monitoring operations for prolonged periods of wakefulness. The paper describes an experiment performed in an isolation chamber to evaluate the effects of

prolonged wakefulness - up to 74 hours - on the performance of operators in reading and processing information from various sensors. A block diagram of a setup for monitoring the sensorimotor functions of operators during prolonged wakefulness is presented and curves indicating operator performance with progressing wakefulness are given. B.J.

A78-47970 # **Human operator in a spacecraft control system during descent in the atmosphere (Chelovek-operator v sisteme upravleniia KLA pri snizhenii v atmosfere).** G. P. Vladychin, N. A. Makhov, V. I. Metlik, A. S. Simonenkov, and L. S. Khachatur'iants. In: Characteristics of cosmonaut activities during flight. Moscow, Izdatel'stvo Mashinostroenie, 1976, p. 127-140. In Russian.

Spacecraft descent with relatively large lift-drag ratio in the atmosphere was simulated on a man-machine loop with manual control. The goal of the study was to evaluate the influence of the human operator on the quality of descent control. The following disturbing effects on the operator were reproduced in the simulation: Coriolis acceleration; variations of oxygen consumption; and the overloading of the operator with additional tasks, thus drawing his attention away from the main control task. The time of sensorimotor response of the operator under these disturbing influences was determined. It is concluded that programmed manual control assures high quality and high accuracy of descent control. B.J.

A78-47971 # **Manual control of astronaut attitude with a three-stage setup (Ruchnoe upravlenie orientatsiei kosmonavta na trekhstepennykh stendakh).** E. V. Dement'ev. In: Characteristics of cosmonaut activities during flight. Moscow, Izdatel'stvo Mashinostroenie, 1976, p. 141-145. In Russian.

The paper considers various experimental aspects of the remote manual control of the attitude of an astronaut, strapped in an EVA mobility unit. Emphasis is placed on the feasibility of the remote attitude-control of an astronaut in a three-stage unsupported mobility unit. Simulation results are presented for distances between the mobility unit and the operator at the controls in the range 16-640 m. Consideration is given to the conditions of illumination of the mobility unit and to the adaptation of the controlling operator's vision to varying degrees of darkness. It is concluded that the utilization of the three-stage unsupported setup is an effective means of investigating the control of angular displacements of an astronaut in an EVA carriage. B.J.

A78-47972 # **Visual work capacity under the action of overloads and elevated temperature (Zritel'naia rabotosposobnost' pri vozdeistvii peregruzok i povyshennoi temperatury).** R. A. Vartbaronov, E. A. Ivanov, A. R. Kotovskaia, G. V. Anisimov, and A. Ia. Frolov. In: Characteristics of cosmonaut activities during flight. Moscow, Izdatel'stvo Mashinostroenie, 1976, p. 145-148. In Russian.

Results are presented for an experimental study designed to assess the quality of performing an oculomotor operation under conditions of centrifugal overloads in the head-pelvis direction in a state of overheating. An informational photographic technique is developed for evaluating the oculomotor coordination of a human operator assigned to pursue a two-way moving target traveling in a sinusoidal trajectory. It is shown that overloading in the head-pelvis direction may deteriorate the visual work of an astronaut operator. The additional influence of overheating contributes to greater reduction of performance quality only when the overload is applied. S.D.

A78-47973 # **Spaceflight stress factors and the ability to track (Stress-faktory kosmicheskogo poleta i funktsiia slezheniia).** V. G. Volkov, E. A. Ivanov, N. N. Lebedeva, and L. S. Khachatur'iants. In: Characteristics of cosmonaut activities during flight. Moscow, Izdatel'stvo Mashinostroenie, 1976, p. 148-154. In Russian.

Model experiments testing the effects of simulated spaceflight stress factors on the ability to track are reported. Investigated stresses include intense noise, vestibular stimulation, prolonged isolation, large-scale reductions in brightness, and the action of antiradiation drugs. The test apparatus simulates the basic operations of cosmonauts with regard to guidance by angular orientation and spacecraft stabilization. A high uniformity of subject response to the stress factors is indicated by the reported results. M.L.

A78-47975 # **Adaptive systems of spacecraft control (Adaptivnye sistemy upravleniia kosmicheskimi letatel'nymi apparatami).** V. M. Vasilets and V. F. Zhernavkov. In: Characteristics of cosmonaut activities during flight. Moscow, Izdatel'stvo Mashinostroenie, 1976, p. 156-160. In Russian.

An indirect-identification algorithm is proposed for the realization of optimal adaptive control of a spacecraft when there is a human operator in the control loop. Optimal modes of operation of a man-in-the-loop control system were investigated on the basis of experimental results regarding manual control of an optical orientation system. It is shown that adaptation of spacecraft control will relieve the emotional stress of the operator, without increasing the rms error of control. Control time decreased by 15% on the average, and the reliability of the total control operation was augmented. B.J.

A78-47976 # **Visual-motor coordination in the simulation of 10-day reduced gravity (Zritel'no-dvigatel'naia koordinatsiia pri modelirovanii desiatisutochnoi gipovesomosti).** E. P. Kugno and V. A. Sutormin. In: Characteristics of cosmonaut activities during flight. Moscow, Izdatel'stvo Mashinostroenie, 1976, p. 160-164. In Russian.

Three specially chosen and prepared operator-subjects were tested for eye-and-hand coordination in a spacecraft-cabin model. Tests involved the sticking of pins into a map viewed through a binocular seeing apparatus and consisted of two stages: (1) the stage of subjectively experienced reduced gravity, supported by posthypnotic suggestion, and (2) the stage of normal gravity after the posthypnotic effects had worn off. The goal set before the subjects was to perform the operations with maximum accuracy and speed. It was found that under prolonged reduced gravity the accuracy of visual-motor coordination deteriorated 2.2 times on the average. Four stages of coordination accuracy were remarked: adaptation, stabilization, fatigue, and prelanding preparedness (where the accuracy reattained a higher level). Prolonged reduced gravity had a substantial effect on speed of performance only in the stage of adaptation to the test procedure. B.J.

A78-47979 # **Mechanisms of self-regulation of the functional system of tracking in normal and pathological states (Mekhanizmy samoreguliatsii funktsional'noi sistemy slezheniia v norme i pri patologii).** A. M. Zingerman, D. N. Menitskii, V. M. Smirnov, L. S. Khachatur'iants, E. A. Ivanov, N. N. Lebedeva, and A. N. Shandurina. In: Characteristics of cosmonaut activities during flight. Moscow, Izdatel'stvo Mashinostroenie, 1976, p. 180-186. In Russian.

The voluntary motor activity of astronauts in space flight is subject to a variety of disruptions associated with weightlessness and other factors. A study was performed to examine the feasibility of modeling motor disruptions in healthy operators by the sensorimotor performance of subjects with impaired motor activity. Three sets of subjects were tested: four healthy subjects; nine subjects with brain damage; and eight subjects suffering from various types of hyperkinesia. Tests were conducted using an automatic tracking recorder: the operator task was one of lining up cross-hair sights with given target points that followed programmed trajectories. The accuracy of tracking is evaluated and compared for the three groups of subjects. B.J.

A78-47980 # **Bioenergetics of control in the state of simulated weightlessness (Bioenergetika upravleniia v sostoianii modeliruemoi gipovesomosti).** G. F. Makarov and A. Ia. Frolov. In: Characteristics of cosmonaut activities during flight. Moscow, Izdatel'stvo Mashinostroenie, 1976, p. 186-191. In Russian.

The paper presents simulation results concerning the effect of weightlessness on the gas-exchange metabolism and bioenergetic characteristics of operators performing spacecraft-control tasks. A three-day space flight was simulated in a spacecraft-cabin model; posthypnotic suggestion was used to induce the subjective experience of reduced gravity and the emotional state associated with space flight in the test subjects. The operator task examined was the manual control of an attitude-control simulator. Results show that simulation of weightlessness by posthypnotic suggestion produces an intensification of the energy metabolism in periods of rest and especially in periods of activity. B.J.

A78-47981 # **Some aspects of depth perception in space (Nekotorye osobennosti glubinnogo zreniia v kosmose).** E. A. Ivanov. In: Characteristics of cosmonaut activities during flight. Moscow, Izdatel'stvo Mashinostroenie, 1976, p. 192-198. In Russian.

The sky as perceived by astronauts in space is a picture of twinkling stars against a black background. In daytime this picture may be supplemented by such objects as satellites, booster stages, debris, and even dust, which are illuminated by the sun; at certain distances from the observer, these objects cannot be distinguished from star points. The present paper describes an experimental study performed to evaluate the threshold of depth perception in the space environment and the associated capacity of the operator to perform visual search of objects on the background of the sky in space. The visual search is performed on the basis of the relative distance of these objects from the sky background. Simulation experiments have yielded data on visual acuity and adaptation conditions in the space environment. The results may be useful in designing devices for facilitating depth perception in space. B.J.

A78-47982 # **Ergonomic evaluation of cross-hair sights (Ergonomicheskaia otsenka vizirnykh marok).** A. Ia. Frolov. In: Characteristics of cosmonaut activities during flight. Moscow, Izdatel'stvo Mashinostroenie, 1976, p. 199-207. In Russian.

Several types of cross-hair sights were evaluated experimentally, with reference to their ergonomic efficiency in spacecraft control systems operated by astronauts. The effects of the following factors on the quality of operator visual-motor coordination during the sighting procedure were evaluated: cross-hair configurations, thickness of hairs, angular size of the central sight zone, and interrelations of sight elements. Averaged numerical results for typical cross-hair sights are presented. B.J.

A78-47983 # **The recognition of objects against a model of cosmic sky (Opoznanie ob'ektov na modeli kosmicheskogo neba).** E. A. Ivanov and A. Ia. Frolov. In: Characteristics of cosmonaut activities during flight. Moscow, Izdatel'stvo Mashinostroenie, 1976, p. 207-218. In Russian.

The ability to distinguish six simple illuminated geometric figures against a dark background with no other light present was studied. These conditions simulate the visual conditions for astronauts. There were three sets of sizes for the figures; within a set, all the figures had the same angular dimension. Six levels of brightness were tested, and the subjects, after dark adaptation, viewed the figures from a distance of 5 m. The effects of angular dimension, illumination, angular orientation, figure simplicity, and other factors on figure discrimination were determined. M.L.

A78-47984 # **Detection of terrestrial landmarks during dark adaptation (Obnaruzhenie nazemnykh orientirov v usloviiakh temnovoi adaptatsii).** A. A. Malofeev and V. F. Zhernavkov. In: Characteristics of cosmonaut activities during flight. Moscow, Izdatel'stvo Mashinostroenie, 1976, p. 218-221. In Russian.

Model experiments to study the detection of light beacons by pilots are reported. The experiments correspond to operator detection of beacons on the earth's surface in regions with uniform brightness and a limited number of beacons when for three minutes before detection the operators are exposed to the light level associated with clouds. The experimental apparatus used to simulate this situation is described. The illumination is reduced from 400 to 4 candles/sq m, and the amount of contrast required for beacon detection is determined. M.L.

A78-47985 # **Visual work capacity of an operator (Zritel'naia rabotosposobnost' operatora).** V. I. Metlik and N. V. Krylova. In: Characteristics of cosmonaut activities during flight. Moscow, Izdatel'stvo Mashinostroenie, 1976, p. 221-228. In Russian.

Tests were conducted to determine operator visual work capacity. They consisted of the detection and recognition of geometrical figures moving slowly across a screen as well as of counting the constitutive elements of these figures. The time of sensorimotor response of the subject during the three stages - detection, recognition, and counting - of the test was monitored. The testing was cycled - four hours of work followed by four hours of rest (or sleep) - the entire experiment lasted five days. Part of the experimentation was conducted under conditions of reduced gravity. In terms of accuracy, the visual work capacity tended to be highest for the stage of detection and lowest for the stage of counting; in terms of time spent, it was the other way around. The level of visual work capacity was higher under conditions of reduced gravity. B.J.

A78-47986 # **Effect of spectral filtering during continuous two-day work (Vliianie spektral'noi fil'tratsii pri nepreryvnoi dvukhsutochnoi rabote).** V. M. Kazachkov, V. I. Metlik, L. S. Khachatur'iants, and E. N. Khludeev. In: Characteristics of cosmonaut activities during flight. Moscow, Izdatel'stvo Mashinostroenie, 1976, p. 228-234. In Russian.

A study was performed to evaluate the effectiveness of different types of optical filters (ZS-1, ZhS-16, and OS-12) in suppressing background reflection and thus reducing the time required for the operator recognition of objects on a background surface. An experiment was devised to determine the effects of these filters on time of recognition for the case of operators working continuously for two days and two nights. The results can be used in solving certain human-factors problems which arise in the optimization of operator performance at complex control panels. B.J.

A78-47987 # **Visual evaluation of simulated elements of lunar relief (Vizual'naia otsenka modeliruemykh elementov lunnogo rel'efa).** L. P. Grimak, T. I. Fedorova, V. N. Shaurov, Iu. I. Movchan, and A. Ia. Frolov. In: Characteristics of cosmonaut activities during flight. Moscow, Izdatel'stvo Mashinostroenie, 1976, p. 234-239. In Russian.

Visual evaluation of lunar surface relief is important for the efficient operation of roving vehicles and crucial for the landing of manned vehicles on the lunar surface. The paper describes an experiment devised to assess operator performance in the visual evaluation of crater depths, slope angles, and rock heights on a lunar-surface model. The accuracy of visual evaluations was subjected to statistical analysis; results showed that most errors were associated with variations in the angle of illumination. B.J.

A78-47988 # **Psychological state of the operator and visual evaluation of lunar relief (Psikhicheskie sostoianiia operatora i zritel'naia otsenka lunnogo rel'efa).** L. S. Khachatur'iants, L. P. Grimak, T. I. Fedorova, Iu. I. Movchan, and A. Ia. Frolov. In: Characteristics of cosmonaut activities during flight. Moscow, Izdatel'stvo Mashinostroenie, 1976, p. 239-243. In Russian.

A simulation experiment was performed to study the effects of emotional tension and subjective weightlessness on the visual performance of an operator who is guiding a spacecraft down to a landing on the lunar surface. The operator task involves the evaluation of the three-dimensional elements of the lunar relief in their relation to the conditions of observation - height of the sun above the horizon, solar azimuth relative to the sighting plane, and angle of inclination of the sighting line relative to the local vertical. Posthypnotic suggestion was used to induce subjective weightlessness and emotional tension in the test subjects; emotional tension was

produced by the suggestion that a mistake in sighting could result in death. Results showed that the induced psychological states caused significant errors in the sighting of craters. B.J.

A78-47989 # Results of visual observations of the atmosphere and landscapes from manned spacecraft (Rezul'taty vizual'nykh nabliudenii atmosfery i landshaftov s pilotiruemykh korablei). A. G. Nikolaev. In: Characteristics of cosmonaut activities during flight. Moscow, Izdatel'stvo Mashinostroenie, 1976, p. 251-255. In Russian.

Visual observations of the atmosphere and surface of the earth from the manned spacecraft Vostok-3 and Soyuz-9 are reviewed. Consideration is given to such visually observed phenomena as haze covering the day horizon at the terminator, a luminous layer of constant thickness of ash-gray color and rosy tint observed when the spacecraft was in shadow, and intense glows lasting about 7 min observed near the South Pole; attention is also given to astronaut observations of distinctive colors associated with different regions on the earth surface. B.J.

A78-48076 Comparison of the visual perception of a runway model in pilots and nonpilots during simulated night landing approaches. H. W. Mertens (FAA, Civil Aeromedical Institute, Oklahoma City, Okla.). *Aviation, Space, and Environmental Medicine*, vol. 49, Sept. 1978, p. 1043-1055. 30 refs.

Relative motion parallax, a cue that can contribute to visual judgments of glide path angle, was studied for its effect on simulated nighttime approaches in two experiments: (1) 16 pilots and 16 nonpilots adjusted the slant of a model runway to make it appear horizontal under nighttime conditions on both dynamic trials, as the model approached them, and on static trials, with the model stationary; (2) 12 pilots and 12 nonpilots performed the same task in dynamic trials while viewing the model in a dark field as before, and while viewing the model within a window which provided a stable visual frame of reference. Neither flying experience nor the visual frame of reference enhanced sensitivity to relative motion parallax. However, some errors were smaller in pilots, indicating that flying experience enhances other runway image cues. Direct judgments of approach angle magnitude indicated overestimation by an approximate factor of 2. These findings indicate large visual illusions in the nighttime situation and suggest that the ineffectiveness of relative motion parallax may be an important part of night approach problems. (Author)

A78-48078 Hypoxia tolerance in rats in relation to tissue glycogen levels. T. Purshottam, U. Kaveeshwar, and H. D. Brahmachari (Defence Research and Development Establishment, Biochemistry Div., Gwalior, India). *Aviation, Space, and Environmental Medicine*, vol. 49, Sept. 1978, p. 1062-1064. 20 refs.

Previous work has shown that rats on high fat (52%) diet (HFD) were hypoxia-resistant compared to rats on carbohydrate (75% CHO) diet (HCD) and on normal diet (ND), as evidenced from their greatly increased survival time on exposure to 10,668 m simulated altitude. Determination of glycogen levels in the heart, skeletal muscle, liver, lungs, and kidneys show that, in hypoxia-susceptible rats, tissue glycogen was decreased in ND and was unchanged in HCD rats. In HFD rats, glycogen in tissues greatly increased on altitude exposure. It is postulated that hypoxia tolerance of HFD rats was enhanced due to: (1) preconditioning to gluconeogenesis and (2) systemic acidosis caused by their increased fat ingestion. (Author)

A78-48079 Performance, mood, and clinical symptoms in men exposed to prolonged, severe physical work and sleep deprivation. P. K. Opstad (Forsvarets Forskningsinstitutt, Kjeller, Norway), R. Ekanger, N. Raabe (Institute of Work Physiology, Oslo, Norway), and M. Nummestad (Norwegian Military Academy, Oslo, Norway). *Aviation, Space, and Environmental Medicine*, vol. 49, Sept. 1978, p. 1065-1073. 26 refs.

A78-48080 Peculiar characteristics of crewmembers' metabolism on the second expedition aboard orbital station Salyut-4. R. A. Tigranian and A. S. Ushakov (Ministerstvo Zdravookhraneniia SSSR, Institut Mediko-Biologicheskikh Problem, Moscow, USSR). *Aviation, Space, and Environmental Medicine*, vol. 49, Sept. 1978, p. 1074-1079. 6 refs.

This paper presents the results of metabolic studies of crewmembers on the second expedition aboard orbital station Salyut-4. Pre- and post-flight medical examinations included measurements of a wide range of biochemical parameters characterizing protein and carbohydrate metabolism, enzyme activity, energy exchange in red blood cells, hormone concentration, etc. It was shown that, during the 63-d flight and 7-d recovery period, crewmembers developed no metabolic changes which could suggest pathologies. The changes were functional and seemed to be manifestations of adaptive reactions to space flight and return to 1 G. Elucidation of mechanisms of the reactions requires further study. (Author)

A78-48081 Spatial disorientation in general aviation accidents. W. R. Kirkham, W. E. Collins, P. M. Grape, J. M. Simpson, and T. F. Wallace (FAA, Civil Aeromedical Institute, Oklahoma City, Okla.). *Aviation, Space, and Environmental Medicine*, vol. 49, Sept. 1978, p. 1080-1086. 20 refs.

Spatial disorientation (pilot vertigo) in aviation refers to the incorrect self-appraisal of the attitude or motion of the pilot and his plane with respect to the earth. The paper documents the occurrence of spatial disorientation in civil aviation accidents and defines the conditions in which spatial disorientation occurs, as revealed by accident statistics. When spatial disorientation is associated with an accident, it is fatal 90% of the time. If external visual cues for proper orientation are missing, as at night or in adverse weather, the pilot may inadvertently maneuver the aircraft violently, thereby overstressing it, or lose control of the aircraft and crash. The material presented is expected to be helpful in educating general aviation pilots about this hazard to flight safety. S.D.

A78-48082 Hypoxia survival variations in male and female mice as functions of chronological and environmental factors. M. Stupfel, A.-J. Valleron, M. Demeestere, and H. Massé (Institut National de la Santé et de la Recherche Médicale, Le Vésinet, Yvelines and Villejuif, Val-de-Marne, France). *Aviation, Space, and Environmental Medicine*, vol. 49, Sept. 1978, p. 1087-1092. 9 refs. Research supported by the Institut National de la Santé et de la Recherche Médicale; Direction des Recherches et Etudes Techniques Contract No. 74-34-687.

A78-48083 Convergence of skin and rectal temperatures as a criterion for heat tolerance. K. B. Pandolf and R. F. Goldman (U.S. Army, Research Institute of Environmental Medicine, Natick, Mass.). *Aviation, Space, and Environmental Medicine*, vol. 49, Sept. 1978, p. 1095-1101. 22 refs.

A78-48084 Hormonal responses of sedentary and exercising men to recurrent heat exposure. R. P. Francesconi, J. T. Maher, J. W. Mason, and G. D. Bynum (U.S. Army, Research Institute of Environmental Medicine, Natick, Mass.; U.S. Army, Walter Reed Army Medical Center, Washington, D.C.). *Aviation, Space, and Environmental Medicine*, vol. 49, Sept. 1978, p. 1102-1106. 26 refs.

A78-48085 Task-specific simulator pretraining and in-flight stress of student pilots. G. S. Krahenbuhl, J. R. Marett, and G. B. Reid (Arizona State University, Tempe, Ariz.). *Aviation, Space, and Environmental Medicine*, vol. 49, Sept. 1978, p. 1107-1110. 15 refs. Contract No. F41609-75-C-0028.

Student pilots (n = 20) were assigned to experimental and control groups. The experimental group received 80 min of high-fidelity, task-specific simulation prior to exposure to the initial power-on stall and spin recovery lesson unit in T-37 pilot training. Both experimental and control groups received orientation simulator experience not related to the aircraft spin series. Catecholamine excretion patterns indicated that the initial power-on stall and spin

recovery lesson unit resulted in a pronounced stress response in both groups. A statistically significant difference in the norepinephrine/epinephrine ratio was found to exist between the experimental and control groups. It was concluded that task-specific simulator pretraining resulted in an altered stress response characterized by lower arousal and greater mental work than was evidenced in the control group. (Author)

A78-48086 Behavior therapy and the treatment of flight phobia. J. E. Carr (Washington, University, Seattle, Wash.). *Aviation, Space, and Environmental Medicine*, vol. 49, Sept. 1978, p. 1115-1119. 28 refs. Research supported by the University of Malaya and China Medical Board.

Research since 1960 was reviewed to compare the relative efficacy of behavior therapy and other therapy modalities in the treatment of flight phobias in trained military aircrew, commercial flight crews, and civilian air travellers. Results indicated that treatment programs involving behavior therapy techniques appeared to have a higher success rate than treatment programs not involving these techniques, especially in cases of focal fear with acute onset under stressful conditions. Other conditions for optimal outcome are outlined and hypotheses for a more programmatic research effort discussed. (Author)

A78-48087 Longevity in military pilots - 37-year followup of the Navy's '1000 Aviators'. N. R. MacIntyre, R. E. Mitchell, A. Oberman, W. R. Harlan, A. Graybiel, and E. Johnson (U.S. Naval Aerospace Medical Center, Aerospace Medical Research Laboratory, Pensacola, Fla.). *Aviation, Space, and Environmental Medicine*, vol. 49, Sept. 1978, p. 1120-1122. 13 refs.

A78-48088 Altitude tolerance of general aviation pilots with normal or partially impaired spirometric function. M. T. Lategola, M. Flux, and P. J. Lyne (FAA, Civil Aeromedical Institute, Oklahoma City, Okla.). *Aviation, Space, and Environmental Medicine*, vol. 49, Sept. 1978, p. 1123-1125. 14 refs.

A comparative study was carried out to assess the altitude tolerance of spirometrically impaired general aviation pilots and spirometrically normal pilots. Cardiorespiratory functions were evaluated in each pilot seated comfortably while breathing only ambient air in an altitude chamber during consecutive periods of 10 min at ground level, 15 min at 8,000 ft and 30 min at 12,500 ft. The average altitude-chamber temperature was 23.5 C. Spirometric assessment of the general aviation pilots revealed moderate degrees of impairment in 12.7% of the sample. This moderate impairment was manifested mainly in the two spirometric parameters FEV 1% and FEF (25-75%), where FEF is the forced midexpiratory flow. These two parameters are considered to be most sensitive in the detection of functional decrements in the peripheral airways. All the other assessed spirometric parameters were found to be roughly normal. S.D.

A78-48410 # Psychophysiological characteristics of pilot activity during low-altitude flights over the sea (Psikhofiziologicheskie osobennosti deiatel'nosti letchika pri poletakh na malykh vysotakh nad morem). P. K. Isakov, S. G. Mel'nik, and N. P. Shchemelev. *Voenno-Meditsinskii Zhurnal*, June 1978, p. 58-60. In Russian.

The effects on pilots of low-altitude flights over the sea, in particular effects caused by reflection and disorientation, are surveyed. The effects are exacerbated by periodic changes in altitude which would accompany the performance of a military mission. Changes in alertness, vision, and the functioning of physiological systems are discussed in a general manner. Recuperation and procedures for alleviating deleterious effects are considered. M.L.

A78-48442 # Studies on adenine acid-soluble nucleotides content in the liver of gamma-irradiated chicken embryos. B. N. Todorov (Higher Institute of Veterinary Medicine, Stara Zagora, Bulgaria). *Bolgarskaia Akademiia Nauk, Doklady*, vol. 31, no. 3, 1978, p. 347, 348. 7 refs.

A78-48506 Movements of the eyes. R. H. S. Carpenter (Gonville and Caius College, Cambridge, England). London, Pion, Ltd., 1977. 433 p. 1080 refs. $27.

The book is divided into three parts in an attempt to reflect the clear distinction that should be made with physiological systems between performance, structure, and the conceptual models that are supposed to link structure to performance, and performance to function. Part 1 is intended as a description of the phenomena of eye movements, Part 2 presents an account of the anatomy of the system (including the mechanical properties of the eye ball itself), and Part 3 attempts to relate this anatomy to the control mechanisms and to assess the contribution of eye movements to visual function. Appendices to the text provide a review of techniques for measuring eye movements along with an introduction to linear systems analysis. S.D.

A78-48511 # Analog simulation of the movements of an ideal manipulator (Modelirovanie na AVM dvizhenii ideal'nogo manipuliatora). A. A. Kobrinskii, V. I. Sergeev, I. T. Cherniavskii, and A. V. Vizniuk. In: Computer solution of problems of applied mechanics (Reshenie zadach prikladnoi mekhaniki na EVM). Moscow, Izdatel'stvo Nauka, 1978, p. 38-48. In Russian.

A method is proposed for constructing the optimal movements of an ideal manipulator with mobility constraints in its kinematic couples. A method of simulating these movements on an analog computer is described, and some simulation results are given. P.T.H.

A78-48522 # Mechanisms of interaction between receptors of the vestibular system (O mekhanizmakh vzaimodeistviia retseptorov vestibuliarnogo apparata). V. M. Gusev, V. A. Kisliakov, I. V. Orlov, L. A. Semenov, and Iu. K. Stolbkov. Leningrad, Izdatel'stvo Nauka, 1978. 117 p. 217 refs. In Russian.

New experimental data are generalized concerning the problem of interaction between receptors of the vestibular system, viz., the semicircular canals and the otolith organs. Novel facts are presented in favor of a hydromechanical relationship between the semicircular canals. Mathematical modeling is used to investigate the role of the common membranous limb in the functioning of the vertical semicircular canals. The vestibular system is regarded as a hydromechanically connected formation. New evidence is presented for the influence of the semicircular canals on the system of otolith reflexes. Characteristics of the nystagmus induced by stimulation of the semicircular canals in the presence of otolith stimuli are examined in some detail. The role of extralabyrinthine factors in human-body responses to acceleration is discussed. S.D.

A78-48524 # Evolution of sleep: Stages of formation of the wakefulness-sleep cycle in a number of vertebrates (Evoliutsiia sna: Etapy formirovaniia tsikla 'bodrstvovanie-son' v riadu pozvonochnykh). I. G. Karmanova. Leningrad, Izdatel'stvo Nauka, 1977. 175 p. 341 refs. In Russian.

A variety of experimental data are analyzed, showing that prior to the onset of multiple-stage sleep, birds, mammals, fish, amphibians, and reptiles exhibit sleeplike states regarded as primary and intermediate forms of sleep, respectively. The stages of formation of the wakefulness-sleep cycle in some species of vertebrates are examined from the standpoint of evolutionary physiology. A hypothesis is advanced on the genesis of slow-wave and paradoxical stages of sleep. S.D.

A78-48529 # Manipulators: Dynamics and algorithms (Manipuliatsionnye roboty: Dinamika i algoritmy). E. P. Popov, A. F. Vereshchagin, and S. L. Zenkevich. Moscow, Izdatel'stvo Nauka, 1978. 400 p. 180 refs. In Russian.

The book gives the mathematical framework for a complete description of the three-dimensional dynamics of manipulator systems and multiple-link mechanisms with arbitrary kinematic configuration and arbitrary number of degrees of freedom. The section on the dynamics and control of the actuators of manipulators includes discussions of homogeneous coordinates and transformations, Gauss's principle of least constraint, Gauss's principle for

kinematic constraints of the fifth kind, generalized forces, dynamic programming, the method of adjoint equations, closed form of the equations for the actuator, exact algorithms for dynamic and force analysis of the actuator, planning the trajectories of a robot and nonlinear control algorithms, and linear algorithms for control at the tactical level. Another section is devoted to algorithms for analysis of visual information and their use in controlling manipulators. P.T.H.

A78-48574 * Calcium transport in Halobacterium halobium envelope vesicles. J. W. Belliveau and J. K. Lanyi (NASA, Ames Research Center, Extraterrestrial Biology Div., Moffett Field, Calif.). *Archives of Biochemistry and Biophysics*, vol. 186, Feb. 1978, p. 98-105. 42 refs.

A78-48575 * Serotonin involvement in pituitary-adrenal function. J. Vernikos-Danellis, K. J. Kellar, D. Kent, C. Gonzales, P. A. Berger, and J. D. Barchas (NASA, Ames Research Center, Biomedical Research Div., Moffett Field; Stanford University, Stanford, Calif.). *New York Academy of Sciences, Annals*, vol. 297, Oct. 28, 1977, p. 518-525; Discussion, p. 526. 35 refs.

Experiments clarifying the effects of serotonin (5-HT) in the regulation of the hypothalamic-pituitary-adrenocortical system are surveyed. Lesion experiments which seek to determine functional maps of serotonergic input to areas involved in regulation are reported. Investigations of the effects of 5-HT levels on the plasma ACTH response to stress and the diurnal variation in basal plasma corticosterone are summarized, and the question of whether serotonergic transmission is involved in the regulation of all aspects of pituitary-adrenal function is considered with attention to the stimulatory and inhibitory action of 5-HT. M.L.

A78-48576 * Loss of circadian rhythmicity in body temperature and locomotor activity following suprachiasmatic lesions in the rat. M. A. Saleh (NASA, Ames Research Center, Biomedical Research Div., Moffett Field, Calif.), P. J. Haro, and C. M. Winget. *Journal of Interdisciplinary Cycle Research*, vol. 8, no. 3-4, 1977, p. 341-346. 17 refs.

In experiments on male and female ambulatory rats, the effect of bilateral suprachiasmatic lesions on deep body temperature and locomotor activity circadian rhythms was investigated. A L/D:12/12 cycle and 23 C ambient temperature were maintained. One-half of the rats received radiofrequency lesions in the suprachiasmic nucleus (SCN) while the second group were sham operated by lowering the radiofrequency electrode to the SCN without producing electrolytic lesions. Four weeks were allowed for recuperation. Autopsies were conducted to make sure that the lesions were restricted to SCN. The results show the complete disappearance of circadian rhythm in the SCN lesioned rats and only a slight diminution for the sham operated rats. M.L.

A78-48578 * Illumination-dependent changes in the intrinsic fluorescence of bacteriorhodopsin. R. A. Bogomolni, L. Stubbs, and J. K. Lanyi (NASA, Ames Research Center, Extraterrestrial Biology Div., Moffett Field; California, University, San Francisco, Calif.). *Biochemistry*, vol. 17, no. 6, 1978, p. 1037-1041. 27 refs. Grants No. NIH-1-R01-GM-23651-01; No. NsG-7151.

The paper describes the intrinsic UV fluorescence of bacteriorhodopsin in some detail and determines the changes during the rapid cyclic reaction following light flashes. The results suggest that several tryptophan residues are affected in the protein, among them one or more exposed to aqueous medium. The kinetics of the fluorescence changes coincide closely with events involving the retinal residue during the deprotonation and reprotonation of the Schiff base group. S.D.

A78-48579 * Methionine transport in Halobacterium halobium vesicles - Noncompetitive, asymmetric inhibition by L-Cysteine. S. L. Helgerson (California, University, San Francisco, Calif.) and J. K. Lanyi (NASA, Ames Research Center, Extraterrestrial Biology Div., Moffett Field, Calif.). *Biochemistry*, vol. 17, no. 6, 1978, p. 1042-1046. 24 refs.

A78-48580 * Effect of suprachiasmatic lesions on diurnal heart rate rhythm in the rat. M. A. Saleh and C. M. Winget (NASA, Ames Research Center, Biomedical Research Div., Moffett Field, Calif.). *Physiology and Behavior*, vol. 19, no. 4, 1977, p. 561-564. 20 refs.

Heart rate and locomotor activity of rats kept under 12L/12D illumination regimen were recorded every six minutes for ten days using implantable radio transmitters. Some of the rats then received bilateral RF lesions into the suprachiasmatic nucleus (SCN). Control sham operations were performed on the rest of the animals. After recovery from surgery, recording of heart rate and locomotor activity was continued for ten days. SCN-lesioned rats showed no significant diurnal fluctuation in heart rate, while normal and sham-operated rats showed the normal diurnal rhythm in that function. The arrhythmic diurnal heart-rate pattern of SCN rats appeared to be correlated with their sporadic activity pattern. The integrity of the suprachiasmatic nucleus is therefore necessary for the generation and/or expression of diurnal rhythmicity in heart rate in the rat. (Author)

A78-48581 * Spectrophotofluorometric and electron microscopic study of Lipofuscin accumulation in the testis of aging mice. J. Miquel, P. R. Lundgren (NASA, Ames Research Center, Biomedical Research Div., Moffett Field, Calif.), and J. E. Johnson, Jr. (National Institutes of Health, National Institute on Aging, Baltimore, Md.). *Journal of Gerontology*, vol. 33, no. 1, 1978, p. 5-19. 55 refs.

A78-48587 # The gastrointestinal tract in hypokinetic rats. P. Groza, A. Bordeianu, S. Cananau, D. Ungureanu, and C. T. Dragomir (Academia Romana, Institutul de Fiziologie Normala si Patologica, Bucharest, Rumania). *COSPAR, Plenary Meeting, 21st, Innsbruck, Austria, May 29-June 10, 1978, Paper.* 9 p. 11 refs.

Morphological and functional changes in the gastrointestinal activity of Wistar rats kept in a hypokinetic state are reported. The rats were kept in special cages for 15, 30, and 60 days, and it was found that the modifications were more striking after 15 days than after 30 days, while after 60 days the modifications disappeared. Changes in the mucopolysaccharide content of the submaxillary, gastric, and duodenal glands; vacuolation of the intestinal goblet cells; the activity of oxyntic cells and G antral cells; gastric secretion; enzyme levels; and an accumulation of eosinophils are described. M.L.

A78-48598 # Dosimetric and biological results from the Bacillus subtilis Biostack experiment within the ASTP. R. Facius, H. Bücker, G. Horneck, G. Reitz, and M. Schäfer (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Frankfurt am Main, West Germany). *COSPAR Plenary Meeting, 21st, Innsbruck, Austria, May 29-June 10, 1978, Paper.* 7 p. 6 refs.

The evaluation of the Bacillus subtilis experiment has been completed. The biological and the physical results for this part of the Apollo-Soyuz-Test-Project (ASTP) Biostack experiment are given. This comprises dosimetric data of the cosmic radiation at that orbit as well as biological findings from two types of plastic detectors. Further, the frequency distributions of the physical quantities - atomic number, energy, and energy loss - of the heavy ions within the sample of spores hit are presented. Conclusions of these results with respect to the possible inactivation mechanism of ionizing particles of cosmic radiation are discussed. (Author)

A78-48604 # Effect of gravity on lymphocyte activation. A. Cogoli, H. R. Böhringer, and M. Morf (Eidgenössische Technische Hochschule, Zurich, Switzerland). *COSPAR, Plenary Meeting, 21st, Innsbruck, Austria, May 29-June 10, 1978, Paper.* 3 p. 6 refs. Swiss National Science Foundation Grant No. 3,109,0,77.

The effect of gravity on the mitogenic activation of rat lymphocytes was studied by culturing the lymphocytes with the mitogen concavalin A in flasks fixed to the rotor of a centrifuge in a breeding room at 37 C. The gravity at the bottom of the flasks was approximately 2 g. Cell activation in culture aliquots was determined

by measuring the incorporation of tritiated thymidine into DNA after a two-hour pulse. It is found that, while maximum stimulation of DNA synthesis at normal gravity occurs at the third day, maximum stimulation in the 2 g cultures occurs at the second day. The finding that the 2 g environment accelerates activation is accompanied by observation of differences between the two cultures in cell morphology and distribution of cell organelles. M.L.

A78-48611 # **The action of space flight factors on radiation effects of additional gamma-irradiation of seeds.** I. D. Anikeeva, E. N. Vaulina, and L. N. Kostina (Akademiia Nauk SSSR, Moscow, USSR). *COSPAR, Plenary Meeting, 21st, Innsbruck, Austria, May 29-June 10, 1978, Paper.* 11 p. 18 refs.

An investigation was conducted into the influence of space flight factors on the radiosensitivity of Crepis capillaris (L) Wallr and Arabidopsis thaliana (L) Heynh seeds that had been subjected to preflight gamma-irradiation. Flight and simulation experiments indicate that dynamic flight factors cause mass damage of meristematic embryonal cells with a simultaneous increase in the radiosensitivity of seeds. It is found that flight factors enhance the effect of preflight irradiation. The observed effects are discussed in terms of chromosome aberrations. B.J.

A78-48623 # **A special photoproduct in DNA, UV-irradiated in vacuo.** H. Bücker, G. Horneck, C. Thomas (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Frankfurt am Main, West Germany), and K. Dose (Mainz, Universität, Mainz, West Germany). *COSPAR, Plenary Meeting, 21st, Innsbruck, Austria, May 29-June 10, 1978, Paper.* 6 p. 11 refs.

Isolated DNA from E. coli B/r cells was UV (254 nm) irradiated under high vacuum (0.1 microtorr) conditions. Compared with wet cells, the formation of cis-syn thymine dimers (TT) was decreased, and the formation of cytosine-thymine dimers (CT) and a photoproduct of R sub F value 0.4 was increased. The latter photoproduct was identified as trans-syn TT which is preferentially produced in heat-denaturated DNA. (Author)

A78-48640 * # **Rat growth during chronic centrifugation.** G. C. Pitts (Virginia, University, Charlottesville, Va.) and J. Oyama (NASA, Ames Research Center, Moffett Field, Calif.). *COSPAR, Plenary Meeting, 21st, Innsbruck, Austria, May 29-June 10, 1978, Paper.* 6 p. 6 refs.

Female weanling rats were chronically centrifuged at 4.15 G with controls at terrestrial gravity. Samples were sacrificed for body composition studies at 0, 28, 63, 105 and 308 days of centrifugation. The centrifuged group approached a significantly lower mature body mass than the controls (251 and 318g) but the rate of approach was the same in both groups. Retirement to 1G on the 60th day resulted in complete recovery. Among individual components muscle, bone, skin, CNS, heart, kidneys, body water and body fat were changed in the centrifuged group. However, an analysis of the growth of individual components relative to growth of the total fat-free compartment revealed that only skin (which increased in mass) was responding to centrifugation per se. (Author)

A78-48645 # **Changes of closely related enzymes and minerals to neuro-muscular systems of albino rats, during prolonged exposure to simulated hypogravics.** H. Saiki, M. Nakaya, M. Sudoh, T. Okomoto, and J. Nakajima (Jikei University, Tokyo, Japan). *COSPAR, Plenary Meeting, 21st, Innsbruck, Austria, May 29-June 10, 1978, Paper.* 8 p.

The effects of hypodynamic suspension which simulates hypogravity on potassium dynamics at the organ level as well as enzyme concentrations in muscle, brain, and serum were studied using rats suspended for up to five weeks. Patterns of change in enzyme activity during the period of adaptation to hypodynamic conditions are described; among others, aldolase, choline esterase, ATPase, and lactate dehydrogenase were studied. Potassium levels in the cerebrum, adrenal glands, kidney, and blood increased after 2.5 weeks but returned to the original level at 5 weeks. The decrease of potassium in muscle tissue is discussed. M.L.

A78-48653 * # **Growth of fungi in NaCl-MgSO4 brines.** S. M. Siegel and B. Z. Siegel (Hawaii, University, Honolulu, Hawaii). *COSPAR, Plenary Meeting, 21st, Innsbruck, Austria, May 29-June 10, 1978, Paper.* 5 p. 6 refs. Grant No. NGL-12-001-042.

Previous investigations have shown that common fungi of the Penicillium-Aspergillus group can be grown in a variety of brines or on moist salt crystals. This simulates salt flats as well as sizeable waterbodies stabilized as saturated brines such as Don Juan Pond (Antarctica), the Great Salt Lake of Utah, and the Dead Sea in the Jordan Valley. In general, salt media rich in KCl are favored over other alkali halides; the media become more selective as the salt concentration rises and nutrient requirements become more complex. In the present paper, it is shown that media which resemble the Dead Sea salt mix can, in fact, support the growth of selected fungal strains, even in the absence of reduced organic nutrients other than glucose. Such media may serve as models for localized microhabitats on Mars. V.P.

A78-48666 # **Technology requirements for non-terrestrial ecosystems.** J. M. Spurlock (Georgia Institute of Technology, Atlanta, Ga.) and M. Modell (MIT, Cambridge, Mass.). *COSPAR, Plenary Meeting, 21st, Innsbruck, Austria, May 29-June 10, 1978, Paper.* 14 p. 5 refs.

A planning overview is presented of some major factors that will be associated with the design of advanced life support systems for operation in the space environment. The identifiable areas of relevant technology, and some specific research topics which can provide key information for scenario formulation and evaluation are summarized in a table. Each of these areas is interdisciplinary and involves integrated contributions from the traditional disciplines (i.e., life sciences, physical sciences, material sciences, social sciences, engineering, and medicine). The considered life support systems for manned space missions are to provide the crew members with food, potable water, a habitable atmosphere, and waste management as well as personal-hygiene facilities. Examples of a partially closed and a completely closed life support system are presented. G.R.

A78-48667 # **Responses of roots to simulated weightlessness on the fast rotating klinostat.** V. Sobick and A. Sievers (Bonn, Universität, Bonn, West Germany). *COSPAR, Plenary Meeting, 21st, Innsbruck, Austria, May 29-June 10, 1978, Paper.* 6 p. 12 refs. Research supported by the Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt.

The behavior of young primary roots of Lepidium sativum L. was studied during their development on a fast-rotating klinostat. The objective was to determine the influence of simulated weightlessness on the perception of gravity and on the centrifugal force. Major conclusions are that (1) primary perception of the gravity stimulus is inhibited; (2) centrifugal forces greater than 0.0043 g are perceived as a stimulus and lead to a curvature in the stimulus direction; (3) below 0.0043 g, curvatures are observed for the first time that cannot be explained by the effect of gravity or centrifugal force; and (4) the curvature reactions occur in the axis of the klinostat without the stimulus of mass acceleration, most probably due to the anatomy and localization of the embryo inside the seed coat. S.D.

A78-48670 * # **Volcanism and soil mercury on Mars - Consequences for terrestrial microorganisms.** B. Z. Siegel and S. M. Siegel (Hawaii, University, Honolulu, Hawaii). *COSPAR, Plenary Meeting, 21st, Innsbruck, Austria, May 29-June 10, 1978, Paper.* 6 p. 19 refs. Research supported by the University of Hawaii; Grant No. NGL-12-001-042: Contract No. EY-76-C-03-1093.

An earth-Mars depletion formula proposed by Anders and Owen for volatiles is used to calculate a range of putative Hg levels for Martian volcanic soils based upon analyzed samples from Hawaii. The range is about 50-150 microgram per kg. When applied either in conventional or special media (e.g., basalt powder), these levels of Hg

are effective inhibitors of the growth of earth microorganisms. Taken together with other hostile chemical and physical factors, volcanic toxicants would appear to provide a further deterrent to the accidental establishment of terrestrial microbiota on Mars. (Author)

A78-48671 * # **Gravity as a biochemical determinant.** S. M. Siegel (Hawaii, University, Honolulu, Hawaii). *COSPAR, Plenary Meeting, 21st, Innsbruck, Austria, May 29-June 10, 1978, Paper.* 20 p. 67 refs. Grant No. NGR-12-001-053; Contracts No. NAS2-6624; No. NAS2-8687.

Hypogravity effects on the biochemistry of living organisms are surveyed, and the differences found under orbital, clinostat, and flotation conditions are examined. Changes can be transient - such as altered serum hormone and electrolyte levels in man - and disappear shortly after return to earth, or changes can be more persistent or permanent, as seems to be the case for changes in the skeletal system mineral and protein constituents for humans who have been in space. While plant ethylene and peroxidase both increase under orbital, clinostat, or flotation conditions, 3-PGA-dehydrogenase increases under orbital but not clinostat conditions and cytochrome C reductase and malic dehydrogenase are affected by clinostat but not actual free fall conditions. Reasons for these discrepancies are considered. M.L.

A78-48679 # **Biological investigations on the orbital station 'Salyut-5'.** E. N. Vaulina, L. R. Palmbakh, V. V. Antipov, I. D. Anikeeva, L. N. Kostina, G. G. Zharikova, and T. B. Kasatkina (Akademiia Nauk SSSR, Moscow, USSR). *COSPAR, Plenary Meeting, 21st, Innsbruck, Austria, May 29-June 10, 1978, Paper.* 9 p.

Experiments were conducted aboard the Salyut 5 orbital station to assess the influence of space flight factors on fish development and behavior, growth and heredity of plants, radiosensitivity of plant seeds and seedlings along with their preliminary gamma radiation. It is shown that space flight factors have adverse effects on some characteristics of seeds and seedlings, and affect the formation of the fungus Polyporus brumalis under zero-gravity conditions. However, the two fish (a male and a female of Lebistes reticulatus) are found to adapt themselves to weightlessness. S.D.

A78-48680 # **Effects of simulated hypogravity on respiration and photosynthesis of higher plants.** C. H. Ward and J. M. King (Rice University, Houston, Tex.). *COSPAR, Plenary Meeting, 21st, Innsbruck, Austria, May 29-June 10, 1978, Paper.* 6 p. 10 refs.

An experimental setup is described for long-duration measurements of respiratory and photosynthetic gas exchange of higher plants - such as marigolds - during continuous vertical and horizontal clinostat rotation. The setup is discussed relative to clinostat, gas exchange chamber, gas analytic system, isolation of potting soil, and experimental procedures. Preliminary data on gas exchange rates obtained through the use of the described experimental setup are also presented. The results point to an enhancement of gas exchange in the horizontal mode. S.D.

A78-48682 # **Genetic effects of cosmic radiation on bacteriophage T4Br/+/ - On materials of biological experiment 'Soyuz-Apollo'.** S. S. Iurov, I. G. Akoev, A. Kh. Akhmadieva, I. A. Livanova, G. A. Leont'eva, A. M. Marennyi, and V. I. Popov (Akademiia Nauk SSSR, Institut Biologicheskoi Fiziki, Pushchino; Ministerstvo Zdravookhraneniia SSSR, Institut Mediko-Biologicheskikh Problem, Moscow, USSR). *COSPAR, Plenary Meeting, 21st, Innsbruck, Austria, May 29-June 10, 1978, Paper.* 5 p.

A78-48684 # **Simulation of circumnutations - Behaviour under different g's.** A. Johnsson and A. Hestnes (Norges Tekniske Hogskole, Trondheim, Norway). *COSPAR, Plenary Meeting, 21st, Innsbruck, Austria, May 29-June 10, 1978, Paper.* 10 p. 11 refs.

The Andersen (1976) quantitative model for Helianthus annuus (sunflower) circumnutations is discussed with reference to experimental data (reported in the literature) concerning the circumnutation of sunflower seedlings subjected to different forces of several g's in a centrifuge. It is concluded that available data do not rule out the model. The desirability of centrifuge experiments under free-fall conditions is indicated, and some physiological features of the plants which could complicate experimental study are considered. M.L.

A78-48699 * # **Is gravity a morphological determinant in plants at the cellular level.** A. D. Krikorian and F. C. Steward (New York, State University, Stony Brook, N.Y.). *COSPAR, Plenary Meeting, 21st, Innsbruck, Austria, May 29-June 10, 1978, Paper.* 27 p. 38 refs. NASA-supported research.

The present paper deals with the question whether plant development can proceed normally in the weightless state, particularly in the critical stage where single cells produce multicellular units, leading to embryos with the growing regions of shoot and root which, in turn, give rise to all the tissues of the plant body. An experiment that tested whether carrot embryos capable of developing from cultured somatic cells could do so under conditions of weightlessness is described. V.P.

A78-48712 # **Microorganisms of the upper layers of the atmosphere and protective role of their cell pigments.** A. A. Imshenetskii, S. V. Lysenko, and S. P. Lach (Akademiia Nauk SSSR, Institut Mikrobiologii, Moscow, USSR). *COSPAR, Plenary Meeting, 21st, Innsbruck, Austria, May 29-June 10, 1978, Paper.* 15 p. 14 refs.

Stable pigmentfree or nearly pigmentfree mutants of the microorganisms Aspergillus niger, Penicillium notatum, Circinella muscae, and Micrococcus albus collected at altitudes 48-77 km were obtained by exposing cultures to UV, and the sensitivity of parent and mutant strains to UV was studied. The black pigment from an Aspergillus strain was isolated, and the protective quality of this pigment was studied by irradiating pigmentfree cells in solutions containing various amounts of the aspergillin pigment. The proportion of pigmented microorganisms is higher at high altitudes than at low altitudes, and it is suggested that pigmented forms have an advantage in that pigments protect the microorganisms against UV-induced damage. M.L.

A78-48713 # **Hornet building orientation in a vertically rotating centrifuge.** J. S. Ishay, E. Megory, A. R. Yunes, B. Perna, F. Konikoff, and Z. J. Ishay (Tel Aviv University, Tel Aviv, Israel). *COSPAR, Plenary Meeting, 21st, Innsbruck, Austria, May 29-June 10, 1978, Paper.* 8 p. 22 refs.

Hornet building orientation was examined by placing workers (Vespa orientalis, Vespinae, Hymenoptera) in artificial breeding boxes (ABBs), constructed to enable clear observation. These were fastened along the arms of a vertically rotating centrifuge. The hornets were thus exposed to gravitational forces of changing strength and direction. The hornets withstood centrifugation and built cells in the following directions: (1) axial (perpendicular to the plane of centrifugation) in ABBs placed in the central part of the centrifuge, and (2) radial (directed along the centrifugal arms) in those places on the centrifuge where the resultant accelerating force was dominantly oriented centrifugally. Results suggest that as long as there is a clearly dominating resultant gravitational force, hornets build in the direction of the dominating force even if it is not constant in strength and direction, but when there is no such force, they build perpendicularly to the alternating gravity. B.J.

A78-48719 * # **Continuous metabolic and cardiovascular measurements on a monkey subject during a simulated 6-day Spacelab mission.** N. Pace, D. F. Rahlmann, R. C. Mains, A. M. Kodama (California, University, Berkeley, Calif.), and E. P. McCutcheon (NASA, Ames Research Center, Biomedical Research Div., Moffett Field, Calif.). *COSPAR, Plenary Meeting, 21st, Innsbruck, Austria, May 29-June 10, 1978, Paper.* 6 p. 6 refs. Grant No. NsG-7262.

An adult male pig-tailed monkey (Macaca nemestrina) with surgically implanted biotelemetry unit was inserted into a fiberglass pod system which was installed in a Spacelab mock-up to simulate a 6-day mission during which extensive physiological measurements were obtained. The purpose of the pod was to make possible the

study of respiratory gas exchange. Body temperature and selected cardiovascular parameters were recorded continuously for 2.6 days prior to 'launch', 6.3 days during 'flight', and 1.8 days after 'landing'. The results are surveyed, and it is concluded that it is feasible to perform sound physiological experiments on nonhuman primates in the Spacelab environment. M.L.

A78-48722 # **Hypergravity - Its effect on the estrous cycle and hormonal levels in female rats.** E. Megory, F. Konikoff, J. S. Ishay, and J. Lelyveld (Tel Aviv University, Tel Aviv, Israel). *COSPAR, Plenary Meeting, 21st, Innsbruck, Austria, May 29-June 10, 1978, Paper.* 7 p. 11 refs.

A78-48752 # **Systems analysis of sympathetic functions (Sistemnyi analiz vegetativnykh funktsii).** V. A. Shidlovskii (Tsentral'nyi Institut Usovershenstvovaniia Vrachei, Moscow, USSR). *Voprosy Kibernetiki,* no. 36, 1977, p. 5-20. 12 refs. In Russian.

Sympathetic functions are functions of inner organs innervated by the sympathetic nervous system or (more generally) functions which, even if unconnected to the sympathetic nervous system, assure a harmonious sympathetic functional state of the entire organism. This paper takes a biocybernetic approach to the problem of modeling sympathetic functions. Consideration is given to the significance of sympathetic functions as intermediary links between the metabolism and the surrounding environment and the relationship of efferent and effector synthesis in a sympathetic functional system. Diagrams are presented, illustrating total changes of sympathetic functions during different forms of physical (including extremal muscular) loading. B.J.

A78-48753 # **Analysis of the contractility of the myocardium of different heart chambers by means of comparing the isometric contraction of isolated stria and the strain-gage recording of isometric stress of the myocardium of an intact functioning heart (Analiz sokratimosti miokarda raznykh otdelov serdtsa putem sopostavleniia izometricheskogo sokrashcheniia izolirovannykh polosok i tenzometricheskoi registratsii izometricheskogo napriazheniia miokarda tselogo rabotaiushchego serdtsa).** V. A. Shidlovskii, N. A. Smirnova, B. Levartovskii, and N. Sanders (Tsentral'nyi Institut Usovershenstvovaniia Vrachei, Moscow, USSR; TsP Obrazovaniia Vrachei, Warsaw, Poland). *Voprosy Kibernetiki,* no. 36, 1977, p. 25-28. In Russian.

A78-48754 # **Analysis of energy metabolism of a functioning heart during hypoxia and variations of functional loading (Analiz energoobmena rabotaiushchego serdtsa pri kislorodnoi nedostatochnosti i izmenenii funktsional'noi nagruzki).** V. L. Vodolazskii (Tsentral'nyi Institut Usovershenstvovaniia Vrachei, Moscow, USSR). *Voprosy Kibernetiki,* no. 36, 1977, p. 32-36. In Russian.

A78-48755 # **Mathematical model of the contractile activity and the chronoinotropism of the myocardium (Matematicheskaia model' sokratitel'noi deiatel'nosti i khronoinotropii miokarda).** V. Ia. Izakov (Sverdlovskii Mezhoblastnyi Kardiokhirurgicheskii Tsentr, Sverdlovsk, USSR), A. K. Tsaturian (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR), and V. A. Shidlovskii (Tsentral'nyi Institut Usovershenstvovaniia Vrachei, Moscow, USSR). *Voprosy Kibernetiki,* no. 36, 1977, p. 53-59. In Russian.

The paper develops a model of the calcium metabolism of the myocardium in relation to the contractile activity of this muscle, with particular emphasis placed on the reaction of calcium and troponine, and the relationship between calcium concentration in muscle cells and the amplitude of muscular contraction. The myocardium is modeled as a three-element structure, consisting of a contractile element, and parallel and series elastic elements. Pair stimulation effects are simulated, and attention is given to transient processes associated with isometric contractions. The model gives a good description of form changes of single contractions as well as of variations in rhythmoinotropic activity. B.J.

A78-48756 # **Investigation of the output of the left ventricle of the human heart (Issledovanie udarnoi moshchnosti levogo zheludochka serdtsa cheloveka).** V. V. Zviagintsev (Tsentral'nyi Institut Usovershenstvovaniia Vrachei, Moscow, USSR). *Voprosy Kibernetiki,* no. 36, 1977, p. 85-91. 8 refs. In Russian.

Impedance cardiography was used to study the average output of the left ventricle of the human heart during expulsion with the aim of monitoring the contractile activity of the myocardium. Four groups of male subjects were tested: 10 long-distance runners, 10 ordinary men with healthy hearts, and two groups with diseased hearts. The contractile activity of the left ventricle is correlated with the phase structure of heart rhythm. It is found that, in order to evaluate myocardial contractility and the adaptation mechanisms of the cardiovascular system, it is necessary to take account of the output of the left ventricle. B.J.

A78-48757 # **Use of a mathematical model for identifying the role of the cardiac component in the regulation of hemodynamics (Ispol'zovanie matematicheskoi modeli dlia vychleneniia serdechnogo komponenta v reguliatsii gemodinamiki).** V. I. Mironenko (Tsentral'nyi Institut Usovershenstvovaniia Vrachei, Moscow, USSR). *Voprosy Kibernetiki,* no. 36, 1977, p. 91-97. 7 refs. In Russian.

A lumped-parameter two-element static model is used to investigate the role of cardiac response (as opposed to purely vascular response) in the regulation of hemodynamic functions. The model includes a description of the arterial and venous reservoirs of the circulatory system, takes account of the homeometric self-regulation of the heart, and presupposes the stabilization of nervous and endocrine effects. The data base used for the modeling was obtained from experiments with dogs, in which EEGs and EKGs were obtained and blood minute volume, arterial pressure, and central venous pressure were all monitored. B.J.

A78-48758 # **Modeling of the heart pumping function (Modelirovanie nasosnoi funktsii serdtsa).** V. A. Lishchuk (Tsentral'nyi Institut Usovershenstvovaniia Vrachei, Moscow, USSR) and A. K. Tsaturian (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR). *Voprosy Kibernetiki,* no. 36, 1977, p. 97-101. 15 refs. In Russian.

A brief review of various models of the heart pumping function is presented. Consideration is given to models in which the heart is represented as an oscillator with internal resistance or as a chamber of variable elasticity; biophysical models in which the pumping function is viewed as being conditioned by the mechanical properties of the myocardium are also discussed. B.J.

A78-48759 # **Aspects of a systems approach to the analysis of the vascular mechanisms of the brain (Osobennosti sistemnogo podkhoda pri analize sosudistykh mekhanizmov golovnogo mozga).** Iu. E. Moskalenko, I. T. Demchenko, and G. V. Vainshtein (Akademiia Nauk SSSR, Institut Evoliutsionnoi Fiziologii i Biokhimii, Leningrad, USSR). *Voprosy Kibernetiki,* no. 36, 1977, p. 116-120. In Russian.

The paper describes a complex-systems approach to the analysis of the brain circulation. The approach includes a study of the principles governing the functional behavior of the circulation and an evaluation of the physiological mechanisms which lie at the basis of this functional behavior. A block diagram is presented of an automatic system for the monitoring of brain circulation; the system provides for electroplethysmography and measurements of cerebral blood flow, arterial pressure, venous pressure, intercranial pressure, and blood-flow temperature. B.J.

A78-48760 # **Realignments of the cardiovascular system of a human operator under the action of negative gravity (Perestroiki serdechno-sosudistoi sistemy cheloveka-operatora pod vliianiem otritsatel'nogo gravitatsionnogo vozdeistviia).** Sh. T. Avetikian, A. M. Zingerman, and D. N. Menitskii (Akademiia Meditsinskikh Nauk SSSR, Leningrad, USSR). *Voprosy Kibernetiki,* no. 36, 1977, p. 123-125. 6 refs. In Russian.

Six subjects were subjected to antiorthostatic effects in sensorimotor-work experiments. The experiments consisted of three modes of operator work: (1) the body being in a horizontal position for 20 min, (2) the body being inclined head down at an angle of 45 deg to the horizontal for 20 min, and (3) a return to the original horizontal position for 20 min. The sensorimotor tracking performance of the operator subjects was determined, and EKG, rheo-EEG, rheograms of the shin, and arterial pressure recordings were obtained. Results indicate a pronounced realignment of the functional mode of the cardiovascular system under antiorthostatic loading; this realignment is directed at the maintenance of homeostatis in general and of sensorimotor performance in particular. B.J.

A78-48761 # **Investigation of the role of basic parameters of blood circulation in the regulation of hemodynamic by means of a mathematical model, identified in an experiment (Issledovanie roli osnovnykh parametrov krivoobrashcheniia v reguliatsii gemodinamiki na matematicheskoi modeli, identifitsirovannoi v eksperimente).** V. I. Mironenko (Tsentral'nyi Institut Usovershenstvovaniia Vrachei, Moscow, USSR). *Voprosy Kibernetiki,* no. 36, 1977, p. 132-139. In Russian.

A78-48762 # **General approach to the modeling of the blood circulation (Obshchii podkhod k matematicheskomu modelirovaniiu krovoobrashcheniia).** V. A. Lishchuk (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR) and D. G. Sadoian (Tsentral'nyi Institut Usovershenstvovaniia Vrachei, Moscow, USSR). *Voprosy Kibernetiki,* no. 36, 1977, p. 140-145. 9 refs. In Russian.

The paper gives a general formalized description of the cardiovascular system as a system of blood transport. The approach is general in the sense that it does not attempt to describe the fine structure of blood flow in various organs and tissues, or processes of microcirculation or hemodynamics regulation, but only examines the overall effect of such processes on blood circulation in a closed-loop cardiovascular system. A balance equation is obtained for flow in a vascular region; the relationship between blood volume and pressure is determined on the basis of Hooke's law; the effect of viscous drag on blood flow is investigated. Modeling expressions for the large vessels and for the heart as a component of the system are presented. B.J.

A78-48823 **Two factors in the perception of velocity at a distance.** W. Epstein (Wisconsin, University, Madison, Wis.). *Perception and Psychophysics,* vol. 24, no. 2, Aug. 1978, p. 105-114. 14 refs. Grant No. PHS-5-R01-MH-26703.

Six experiments dealing with the effect of the surrounding framework on the perceived velocity of movement were reported. Experiment 1 reproduced Brown's (1931) transposition of velocity effect. Experiment 2 demonstrated the application of relational determination to the explanation of speed constancy. Experiment 3 showed that the relational effect is independent of the perceived sizes and perceived distances of the frameworks of movement. Only relative retinal size need be considered. Experiment 4 showed that relational factors can generate large deviations from speed constancy. Experiments 5 and 6 showed that only the immediately proximate frame needs to be taken into account in assessing effects on velocity. Despite the successes of the hypothesis of relational determination, it was argued that two factors are needed to explain perceived velocity: relative object-relative displacement accounting for perceived relative velocity, and a distance calibration mechanism explaining perceived absolute velocity. (Author)

A78-48824 **Subjective motion and acceleration induced by the movement of the observer's entire visual field.** S. C. P. Wong and B. J. Frost (Queen's University, Kingston, Ontario, Canada). *Perception and Psychophysics,* vol. 24, no. 2, Aug. 1978, p. 115-120. 25 refs.

Three experiments were carried out to trace the developmental time course of apparent subjective rotation induced by rotating a tall striped drum around an observer. In Experiment 1, rotation of the drum led to increasingly frequent reports of subjective rotation over the first 30 sec of stimulation by the optokinetic stimulus, after which subjects experienced mostly apparent subjective rotation and a small amount of drum rotation. In Experiment 2, using a magnitude estimation technique to assess the speed of drum and subjective rotation, subjects reported subjective acceleration and drum deceleration of about the same magnitude over the first 30 sec of the 1-min trial, followed by a steady level of subjective rotation with some residual drum movement. In Experiment 3, using three different drum speeds, it was found that the speed of steady-state rotation, as well as subjective acceleration and drum deceleration, are linear functions of the speed of the inducing stimulus. Implications of these observations towards the explanation of how we perceive a stable environment during locomotion are discussed. (Author)

A78-48825 **Involuntary automatic processing in color-naming tasks.** J. Regan (California, University, Berkeley, Calif.). *Perception and Psychophysics,* vol. 24, no. 2, Aug. 1978, p. 130-136. 20 refs.

The automatic processing hypothesis holds that very familiar items are processed involuntarily, and two color-naming experiments were designed to test this further. Experiment 1 employed words as written stimuli and focal and nonfocal colors as inks. Supporting the automatic processing hypothesis, neutral words delayed color naming, indicating that their representations were activated involuntarily. There was no interaction of ink type and written item conditions. Experiment 2 employed single letters as written stimuli. Color-name initials delayed color naming when incompatible with the color and facilitated it when compatible, suggesting that, although letters may be processed involuntarily, the way in which they are encoded is influenced by the cognitive context. The data from both experiments were discussed in relation to current interpretations of Stroop effects. (Author)

A78-49150 **Atrial flutter - Electrocardiographic, vectorcardiographic and echocardiographic correlation.** O. Zoneraich, S. Zoneraich, J. J. Rhee, and D. Jordan (New York, State University, Stony Brook; Queens Hospital Center, Jamaica, N.Y.). *American Heart Journal,* vol. 96, Sept. 1978, p. 286-294. 21 refs.

The duration, contour, and amplitude of atrial flutter wave were studied by ECG and VCG in 32 (23 M, 9 F) cardiac patients, aged 33-94 yr (average 68 yr), and were related to the size of the left atrium measured by the echocardiogram. The ECG parameters measured were duration of left atrial depolarization, amplitude of left atrial wave, surface area of left atrial wave, and maximum amplitude of the atrial flutter wave in lead 2 and precordial V1. The results indicate that both the size of the left atrium and conduction delays play an essential role in the duration and contour of left atrial wave. S.D.

A78-49257 **Dynamic decoupling of a remote manipulator system.** J. S.-C. Yuan (SPAR Aerospace Products, Ltd., Toronto, Canada). *IEEE Transactions on Automatic Control,* vol. AC-23, Aug. 1978, p. 713-717. 9 refs. National Research Council of Canada Contract No. S/N-ISR-76,00092.

The dynamic decoupling problem for a rigid body model of a remote manipulator system is studied. An open-loop decoupling compensator is proposed, which is compatible with the independent-joint-control design philosophy currently adopted in most industrial manipulator systems. Decoupling is achieved by implementing a precompensator at the input to the joint drive system. The feasibility of the decoupling scheme is demonstrated via simulation experiments on the model of a two-joint manipulator system with arms in planar motion. (Author)

A78-49262 * **Effectiveness of basic display augmentation in vehicular control by visual field cues.** A. J. Grunwald (NASA, Langley Research Center, Hampton, Va.; Technion - Israel Institute of Technology, Haifa, Israel) and S. J. Merhav (Technion - Israel Institute of Technology, Haifa, Israel). *IEEE Transactions on*

Systems, Man, and Cybernetics, vol. SMC-8, Sept. 1978, p. 679-690. 10 refs. Research supported by the Ministry of Defence of Israel.

The paper investigates the effectiveness of different basic display augmentation concepts - fixed reticle, velocity vector, and predicted future vehicle path - for RPVs controlled by a vehicle-mounted TV camera. The task is lateral manual control of a low flying RPV along a straight reference line in the presence of random side gusts. The man-machine system and the visual interface are modeled as a linear time-invariant system. Minimization of a quadratic performance criterion is assumed to underlie the control strategy of a well-trained human operator. The solution for the optimal feedback matrix enables the explicit computation of the variances of lateral deviation and directional error of the vehicle and of the control force that are used as performance measures. B.J.

A78-49263 Head rotational spectral characteristics during two-dimensional smooth pursuit tasks. D. K. Shirachi (Computer Sciences Corp., Mountain View, Calif.), D. L. Monk (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio), and J. H. Black, Jr. (Harvard University, Cambridge, Mass.). *IEEE Transactions on Systems, Man, and Cybernetics*, vol. SMC-8, Sept. 1978, p. 715-724. 8 refs. Research supported by the National Academy of Sciences and U.S. Air Force.

A comparative study between single-axis and dual-axis smooth pursuit head motion tasks using a Honeywell helmet-mounted sight was undertaken to determine differences in human performance dynamics between the two tasks. Furthermore, the effects of variations in the headgear weight and size of the stimulus trajectory envelope were studied as possible factors which may affect the level of performance attainable by the human operator. Distinct differences were observed for coherence and transfer function gain and phase between single-axis and dual-axis tracking performance and between horizontal and vertical head movement responses. Dual-axis responses had larger coherence functions, larger gains, and less phase lag than their single-axis counterparts, and vertical axis responses had lower coherences but greater gain than the horizontal axis responses. Increases of helmet weight had no noticeable effect on tracking performance, but increases in the size of the stimulus trajectory envelope produced increases of transfer function gain, suggesting an amplitude nonlinearity. (Author)

A78-49272 # Perceived magnitudes of distortion, secondary imaging, and rainbowing in aircraft windshields. F. E. Gomer and R. G. Eggleston (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio). *Human Factors*, vol. 20, Aug. 1978, p. 391-400. 6 refs.

Distortion, secondary imaging, and rainbowing are perhaps the most critical optical problems inherent to windshields designed for high performance aircraft. Although manufacturers are required to inspect each windshield and render perceptual decisions about the severity of these optical problems, the procedures followed by different observers vary greatly. As a result, visual quality control can be improved significantly. This report describes the successful application of a psychophysical method for scaling visual judgements concerning the apparent magnitudes of distortion, secondary imaging, and rainbowing in current Air Force F-111 windshields. (Author)

A78-49273 Describing the human operator's internal model of a dynamic system. R. J. Jagacinski and R. A. Miller (Ohio State University, Columbus, Ohio). *Human Factors*, vol. 20, Aug. 1978, p. 425-433. 11 refs.

An analysis of phase-plane switching loci was used to infer the human operator's internal model of a dynamic system he was attempting to control. Striking differences were found between the internal model and the actual dynamic system, and the internal model exhibited orderly changes with practice. The difficulties involved in incorporating a non-veridical internal model into optimal control models of the human operator are discussed. (Author)

A78-49274 Residual attention as a predictor of pilot performance. D. L. Damos (Illinois, University, Urbana, Ill.). *Human Factors*, vol. 20, Aug. 1978, p. 435-440. 12 refs. Contract No. F44620-70-C-0105.

Residual attention is measured in 16 student pilots assigned to perform a task combination. The objective is to examine the correlations between a measure of residual attention obtained by cross-adaptive techniques and scores obtained on initial flight checks. The usefulness of residual attention as a short-range predictor of pilot success is indicated by the increase in the multiple correlations as a function of flight training. The increase in predictive validity suggests that residual attention may be a long-range predictor of pilot performance. S.D.

A78-49275 A reaction time analysis of instrument scanning. J. DeMaio (USAF, Human Resources Laboratory, Williams AFB, Ariz.), S. R. Parkinson, and J. V. Crosby (Arizona State University, Tempe, Ariz.). *Human Factors*, vol. 20, Aug. 1978, p. 467-471. 14 refs.

Detection and latency performance of instructor pilots and student pilots was compared in a task which required searching an aircraft instrument display for target deviations from a desired course. Performance of instructors was superior to that of students on both detection and latency measures. The use of stable fixation queues was reflected in the latency performance of students. The latency performance of instructors was much less affected by the use of such queues. Results were interpreted to suggest that experienced pilots are able to place a greater reliance on peripheral vision in scanning instrument displays. (Author)

A78-49297 The microvibrations of the body, an index for examination stress. M. Bircher, J. Kohl, E. A. Koller (Zürich, Universität, Zurich, Switzerland), and B. Nigg (Eidgenössische Technische Hochschule, Zurich, Switzerland). *European Journal of Applied Physiology*, vol. 39, no. 2, 1978, p. 99-109. 24 refs.

Whole-body microvibrations were determined for 123 human subjects at times of psychological stress and calm, and the microvibration pattern is correlated with performance on a school examination (the psychological stress). Microvibrations are considered to be involuntary uninterrupted irregular mechanical microoscillations with frequencies mainly between 8-13 Hz, and the force oscillations along three-dimensional axes were measured during quiet bipedal standing and simultaneously recorded as a time function with the rectified and integrated force-time function. While all subjects showed high values before the examination, successful candidates showed low values when tested after a vacation. In the pre-exam measurement, smokers and people who took tranquilizers showed higher values than others, and women showed less tension than men. M.L.

A78-49298 Metabolic and thermal responses of men wearing cold-protective clothing to various degrees of cold stress. M. Tanaka (Showa University, Tokyo, Japan). *European Journal of Applied Physiology*, vol. 39, no. 2, 1978, p. 137-144. 15 refs.

A78-49299 Measurements of potassium changes in the cat carotid body under hypoxia and hypercapnia. H. Acker (Max-Planck-Institut für Systemphysiologie, Dortmund, West Germany). *Pflügers Archiv*, vol. 375, no. 3, Aug. 1978, p. 229-232. 11 refs.

With the aid of potassium-sensitive microelectrodes reinforced by bitumen (tip diameter, 1.5 micrometers), extracellular potassium activity and DC potential were measured in the cat's carotid body. Under normoxic and normocapnic conditions, potassium values of 1-16 mM (mean value 7.2 mM, standard deviation 3.8 mM) and DC potential values of - 11 mV to + 13 mV were recorded. With hypoxia, extracellular potassium activity increased by between 1 mM and 9 mM; DC potential was reduced by between 0.5 and 3 mV. With hypercapnia, extracellular potassium activity decreased by between 1 mM and 5 mM: changes in DC potential were variable. The results suggest that, during hypoxia, potassium influences the

nervous structures in the carotid body whereas this influence is absent during hypercapnia. (Author)

A78-49300 Susceptibility of the cat's visual system to hypoxia, hypotonia and circulatory arrest. U. T. Eysel (Berlin, Freie Universität, Berlin, West Germany). *Pflügers Archiv*, vol. 375, no. 3, Aug. 1978, p. 251-256. 23 refs.

In the reported investigation sum potentials were recorded simultaneously from five levels of the afferent visual system of the cat to determine the sequence and time courses of failure. Attention was given to the retina, the optical tract, the lateral geniculate nucleus, the superior colliculi, and the visual cortex. It was found that in cats with intact eyes the b-wave of the ERG began to decline about 15 sec after the beginning of respiration with 100% nitrogen. At the same time all other measured potentials increased. This increase was most pronounced in the visual cortex, followed by the lateral geniculate nucleus, the superior colliculi, and the optic tract. After about 40-45 sec the spontaneous EEG discontinued and after 55-60 sec a fast amplitude decay began in all electrically evoked sum potentials except the optic tract response. G.R.

A78-49406 # Simulator study for the determination of the demands upon the pilot in the case of unconventional, spatially curved approach profiles (Simulatoruntersuchung zur Bestimmung der Pilotenbeanspruchung bei unkonventionellen, räumlich gekrümmten Anflugprofilen). W. Heinze. Braunschweig, Technische Universität, Naturwissenschaftliche Fakultät, Dokter der Naturwissenschaften Dissertation, 1977. 179 p. 31 refs. In German.

A change in the flight procedures taking place during the next few years will involve an employment of approach methods which make it possible to use curved flight paths for the approach in the vicinity of airports. The new approach procedure will permit the pilot to fly around residential areas. At the same time it is attempted to obtain an optimum separation for aircraft by making use of variable approach profiles. The reported investigation is concerned with the effects which an implementation of the new approach procedure will have on the pilot. Studies conducted with the aid of a simulator include tests in which five experienced pilots performed a total of 120 approaches involving different approach profiles and wind conditions. An evaluation was made of parameters related to the control of the aircraft, physiological parameters, factors dealing with perception, and psychological factors. G.R.

A78-49584 # Age-related changes in glycolysis in the rat liver during high-altitude acclimatization (Vozrastnye izmeneniia skorosti glikoliza v pecheni krys pri akklimatizatsii k vysokogor'iu). N. Berdier, S. I. Durova, and I. I. Agabekova (Tadzhikskii Gosudarstvennyi Meditsinskii Institut, Dyushambe, Tadzhik SSR). *Akademiia Nauk Tadzhikskoi SSR, Doklady*, vol. 21, no. 3, 1978, p. 61-64. 10 refs. In Russian.

A78-49700 # State of hypothalamo-hypophyseal neurosecretory system during hyperbaric oxygenation (Stan gipotalamo-gipofizarnoi neirosekretornoi sistemi pri giperbarichnii oksigenatsii). I. I. Gerzanich (Akademiia Nauk Ukrains'koi RSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Akademiia Nauk Ukrains'koi RSR, Dopovidi, Seriia B - Geologichni, Khimichni ta Biologichni Nauki*, June 1978, p. 544-547. 7 refs. In Ukrainian.

The functional state of the hypothalamo-hypophyseal neurosecretory system was studied in male rats subjected to elevated oxygen pressure of 3 atm for one hour. Hyperbaric oxygenation of this degree steps up the processes of secretion formation and extraction in the supraoptic and paraventricular cores and increases the deficit of neurosecretion in the dystal departments of the hypothalamo-hypophyseal system. These changes in the neurosecretory centers persisted one hour after the experiment. Six hours after the experiment the secretion extraction processes in the paraventricular and supraoptic cores increased. After 24 hours the functions of both cores returned to normal. P.T.H.

A78-49801 # Processes of learning complex behavior (Protsessy naucheniia slozhnomu povedeniiu). M. L. Voronova, A. S. Kleshchev, and L. A. Firsov (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 240, June 11, 1978, p. 1248-1251. 12 refs. In Russian.

Consideration is given to the formulation of bionic models for the analysis of learning processes in complex experimental situations on the basis of the theory of the analyticosynthetic activity of the brain, with consideration of decision making processes and the mathematical modeling of behavior responses. The experiment discussed involves the training of chimpanzees in a complex experimental environment by means of stimuli of differing importance. A probabilistic description of the training process is given. B.J.

A78-49898 # Application of commercially available filter components for psychoacoustic testing. R. L. McKinley and E. A. Johnston (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio). In: NAECON '78; Proceedings of the National Aerospace and Electronics Conference, Dayton, Ohio, May 16-18, 1978. Volume 1. New York, Institute of Electrical and Electronics Engineers, Inc., 1978, p. 390-392.

A description is presented of the design and construction of a general purpose 1/3 octave band filter that has a large number of applications in acoustics. The accuracy and precision in addition to the significant cost benefits derived make the filter design a viable solution to applicable signal conditioning requirements. The acoustic signal processing unit considered provides the very precise narrow band filtering of audioacoustic signals required in psychoacoustic activities involving the human ear as the sensor. The outstanding features of this signal processor are the practical simplicity of its construction and its extreme cost effectiveness when compared to commercially available instruments with comparable performance specifications. G.R.

A78-50024 Blood gases at several levels of oxygenation in rats with a left-shifted blood oxygen dissociation curve. Z. Turek, F. Kreuzer, and B. E. M. Ringnalda (Nijmegen, Katholieke Universiteit, Nijmegen, Netherlands). *Pflugers Archiv*, vol. 376, no. 1, Aug. 1978, p. 7-13. 29 refs.

The effect of a blood oxygen dissociation curve (ODC) shift on oxygen transport at different degrees of hypoxia in intact rats was studied. A major displacement of the ODC to the left was achieved by chronic administration of sodium cyanate, and arterial and mixed-venous partial oxygen pressure, partial CO2 pressure, and pH were measured at normoxia and during exposure to 14.9, 8.0, or 5.6% oxygen in nitrogen. The results confirm theoretical deductions that rats with a left-shifted ODC have an impaired oxygen transport to tissues at normoxia and mild hypoxia but have a more efficient oxygen transport at severe hypoxia as compared with rats with an unshifted ODC. M.L.

A78-50025 Visual evoked responses to the upper and lower half-field stimulation in a dark-adapted man. J. Peregrin, I. Pastrnakova, and A. Pastrnak (Karlova Universita, Hradec Kralove, Czechoslovakia). *Pflügers Archiv*, vol. 376, no. 1, Aug. 1978, p. 81-86. 15 refs.

Averaged visual evoked responses (VER) to flashed blank and checkerboard-patterned stimulation of the upper and lower half-field of 6 deg angular subtense were recorded referentially in seven dark-adapted subjects for a luminance range of 3.69 log units (maximum luminance equal to 2220 cd/sq m). The peak latencies of the maximum positive-negative deflection of the VER to the upper and lower half-field blank and to the upper half-field patterned stimulation display a monotonic shortening with respect to the logarithmic increase of stimulation luminance. The peak latencies of the VER to the lower half-field patterned stimulation are described. The data indicate that VER to the lower half-field patterned stimulation only contain a pattern-related component. M.L.

A78-50080 **The effect of rotational vibration in roll and pitch axes on the discomfort of seated subjects.** K. C. Parsons and M. J. Griffin (Southampton, University, Southampton, England). *Ergonomics*, vol. 21, Aug. 1978, p. 615-625. 14 refs.

The paper describes an experiment performed to study the effects of vibration level, frequency, and foot position on the discomfort of seated persons subjected to sinusoidal vibration in roll and pitch axes. Using the method of category production, eight seated subjects adjusted roll and pitch vibrations to levels described as 'uncomfortable' on a given semantic scale. For seated subjects with a stationary foot rest, rotational vibration in roll produced greater discomfort than the same level of rotational vibration in pitch. Sensitivity to rotational acceleration decreased with increasing frequency of rotational vibration (from 1.6 to 31.5 Hz) in both roll and pitch axes and for all foot positions. Subjects became less sensitive to rotational vibration in roll and, especially, in pitch as foot height was raised. This can be attributed to higher foot-rests causing less contact between the thighs and the rotating seat. B.J.

A78-50081 **Predicting the effects of dual-frequency vertical vibration on continuous manual control performance.** C. H. Lewis and M. J. Griffin (Southampton, University, Southampton, England). *Ergonomics*, vol. 21, Aug. 1978, p. 637-650. 14 refs. Research supported by the Ministry of Defence (Procurement Executive).

Three methods of predicting the effect of dual-frequency vertical whole-body vibration on manual-control tracking performance, given a knowledge of the separate effects of each frequency, are compared. The total rms tracking error, rms input-correlated error, and rms remnant in each axis of a two-dimensional pursuit tracking task during combined 3.15 and 5.00 Hz vertical whole-body vibration were predicted from (1) the rms sum of weighted components, (2) the most severe component alone, and (3) the arithmetic sum of weighted components. The best predictions of total rms tracking error, compared with measured levels, were with method (1) and the worst with method (3). B.J.

A78-50082 **The stability of equal sensation contours for whole-body vibration.** D. J. Oborne (Swansea, University College, Swansea, Wales). *Ergonomics*, vol. 21, Aug. 1978, p. 651-658. 10 refs.

Individual equal sensation contours for whole-body vibration in the 3-80 Hz frequency range were obtained from 20 subjects using the modified matching procedure described by Oborne and Humphreys (1976). Each subject provided two sets of contours, the second set being obtained after an elapsed time (between 1 and 66 days). In each case the curves obtained on the two occasions were extremely similar in shape, indicating the stability of individual response to whole-body vibration over time. Considerable variability existed, however, between the contours of indvidual subjects. B.J.

A78-50085 # **NGL advances.** *Aircraft Engineering*, vol. 50, Aug. 1978, p. 19-22.

The design and operation of the valveless stabilized liquid oxygen converter, the oxygen supply system of the Tornado (MRCA) aircraft, are described. Photographs and schematic diagrams of the converter and its components are presented, and the converter is compared to other oxygen supply systems. B.J.

STAR ENTRIES

N78-30796*# Texas Univ., Houston.
BIOCHEMICAL ADAPTATIONS OF ANTIGRAVITY MUSCLE FIBERS TO DISUSE ATROPHY Progress Report, 1 Aug. 1977 - 31 Jul. 1978
Frank W. Booth 31 Jul. 1978 28 p refs
(Contract NAS9-15388)
(NASA-CR-151822) Avail: NTIS HC A03/MF A01 CSCL 06C

Studies are presented in four parts of this report. The four parts include: (1) studies to gain information on the molecular basis of atrophy by antigravity muscle; (2) studies on the work capacity of antigravity muscles during atrophy and during recovery from atrophy; (3) studies on recovery of degenerated antigravity fibers after removal of hind-limb casts; and (4) studies on the atrophy and recovery of bone. The philosophy of these studies was to identify the time sequence of events in the soleus muscle of the rat following immobilization of the hind limbs, so that the length of the soleus muscle within the fixed limb is less than its resting length. In two separate studies, no decline in the weight of the soleus muscle could be detected during the first 72 hours of limb immobilization. G.Y.

N78-30797*# California Univ., Davis. Dept. of Animal Physiology.
EFFECT OF ALTERED GRAVITY ON TEMPERATURE REGULATION IN MAMMALS: INVESTIGATION OF GRAVITY EFFECT ON TEMPERATURE REGULATION IN MAMMALS Final Technical Report, Nov. 1973 - Jul. 1977
B. A. Horwitz and J. M. Horowitz Jul. 1977 7 p refs
(Grant NGR-05-004-099)
(NASA-CR-157570) Avail: NTIS HC A02/MF A01 CSCL 06C

Male, Long-Evans hooded rats were instrumented for monitoring core and hypothalamic temperatures as well as shivering and nonshivering thermogenesis in response to decreased ambient temperature in order to characterize the nature of the neural controller of temperature in rats at 1G and evaluate chronic implantation techniques for the monitoring of appropriate parameters at hypergravic fields. The thermoregulatory responses of cold-exposed rats at 2G were compared to those at 1G. A computer model was developed to simulate the thermoregulatory system in the rat. Observations at 1 and 2G were extended to acceleration fields of 1.5, 3.0 and 4.0G and the computer model was modified for application to altered gravity conditions. Changes in the acceleration field resulted in inadequate heat generation rather than increased heat loss. Acceleration appears to impair the ability of the neurocontroller to appropriately integrate input signals for body temperature maintenance. A.R.H.

N78-30798*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
ASSESSMENT OF FREE-LIVING NITROGEN FIXING MICROORGANISMS FOR COMMERCIAL NITROGEN FIXATION
B. O. Stokes and C. J. Wallace 1 Aug. 1978 153 p refs
(Contract NAS7-100; Grant NSF AER-76-09093)
(NASA-CR-157565, JPL-Pub-78-60) Avail: NTIS HC A08/MF A01 CSCL 06C

Ammonia production by Klebsiella pneumoniae is not economical with present strains and improving nitrogen fixation to its theoretical limits in this organism is not sufficient to achieve economic viability. Because the value of both the hydrogen produced by this organism and the methane value of the carbon source required greatly exceed the value of the ammonia formed, ammonia (fixed nitrogen) should be considered the by-product. The production of hydrogen by KLEBSIELLA or other anaerobic nitrogen fixers should receive additional study, because the activity of nitrogenase offers a significant improvement in hydrogen production. The production of fixed nitrogen in the form of cell mass by Azotobacter is also uneconomical and the methane value of the carbon substrate exceeds the value of the nitrogen fixed. Parametric studies indicate that as efficiencies approach the theoretical limits the economics may become competitive. The use of nif-derepressed microorganisms, particularly blue-green algae, may have significant potential for in situ fertilization in the environment. A.R.H.

N78-30799*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SMD 3 POST TEST MEDICAL REPORT
Jerry R. Hordinsky 24 May 1977 24 p
(NASA-TM-79750; JSC-13076; SE-SMD-III-081) Avail: NTIS HC A02/MF A01 CSCL 06B

One of several reports that were prepared to document the results of the Spacelab Mission Development Test 3 is presented. This report covers clinical support to the crew as well as assistance and counsel to others in crew selection, health stabilization of the crew and the laboratory animals, and habitability and duty schedules. G.Y.

N78-30800# California Univ., Berkeley. Lawrence Berkeley Lab. Lab. of Chemical Biodynamics.
FERMENTATION AND HYDROCARBONS
Melvin Calvin 12 Jun. 1978 62 p refs Presented at 2d Latin-Am. Botan. Congr., Brasilia, Brazil, 22-27 Jan. 1978
(Contract W-7405-eng-48)
(LBL-7270; Conf-780128-1) Avail: NTIS HC A04/MF A01

Photosynthesis is examined as a possible annually renewable resource for material and energy. The production of fermentation alcohol from sugar cane as a major component of materials for chemical feedstocks is examined as well as the direct photosynthetic production of hydrocarbon from known plant sources. Experiments are underway to analyze the hydrocarbons from Euphorbias, Asclepias and other hydrocarbon-containing plants with a view toward determining their various chemical components. In addition, experimental plantings of plants of this type have begun to obtain data on which species would be the most successful. Work is also underway on the development of chemical process techniques for the extraction of plant materials after harvesting. In addition, efforts are underway to construct synthetic systems on the basis of the knowledge of the natural photosynthetic processes. These systems could be used to produce fuel, fertilizer, and power. As a result of studies of the natural quantum conversion process in green plants, several photoelectron transfer processes, some of which have already been demonstrated in synthetic systems, can be envisaged. Methods of constructing systems of this type and the principles of their use are described. ERA

N78-30801# National Technical Information Service, Springfield, Va.
BIOCHEMICAL OXYGEN DEMAND, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Final Report, 1975 - 1976
Robena J. Brown Jun. 1978 248 p
(NTIS/PS-78/0574/0) Avail: NTIS HC $28.00/MF $28.00 CSCL 13B

A broad range of citations dealing with biochemical oxygen demand (BOD) in sewage, industrial waste treatment, and limnology are presented. These studies include topics on BOD reduction, models, and biological factors. While many of the reports include a detailed analysis of BOD, some treat the subject only briefly. GRA

N78-30802# National Technical Information Service, Springfield, Va.
BIOCHEMICAL OXYGEN DEMAND, VOLUME 3. A BIBLIOGRAPHY WITH ABSTRACTS Final Report, 1977 - May 1978
Robena J. Brown Jun. 1978 85 p Supersedes NTIS/PS-77/0417; NTIS/PS-76/0410; NTIS/PS-75/375; COM-73-11585 (NTIS/PS-78/0575/7; NTIS/PS-77/0417; NTIS/PS-76/0410; NTIS/PS-75/375; COM-73-11585) Avail: NTIS HC $28.00/MF $28.00 CSCL 13B
For abstract, see N78-30801.

N78-30803# Environmental Monitoring and Support Lab., Las Vegas, Nev. Monitoring Operations Div.
DISTRIBUTION OF PHYTOPLANKTON IN TENNESSEE LAKES Technical Report, 7 Mar. - 14 Nov. 1973
F. A. Hiatt, S. C. Hern, J. W. Hilgert, V. W. Lambou, F. A. Morris, M. K. Morris, L. R. Williams, and W. D. Taylor Jan. 1978 75 p refs Prepared in cooperation with Nevada Univ., Las Vegas
(PB-280139/7; EPA-600/3-78-016) Avail: NTIS HC A04/MF A01 CSCL 13B
The species and abundance data of phytoplankton in the 16 lakes sampled by the National Eutrophication survey in the State of Tennessee are presented. Results from the calculation of several water quality indexes are also included. GRA

N78-30804# Environmental Monitoring and Support Lab., Las Vegas, Nev. Monitoring Operations Div.
DISTRIBUTION OF PHYTOPLANKTON IN OHIO LAKES Technical Report, 7 Mar. - 14 Nov. 1973
J. W. Hilgert, V. W. Lambou, F. A. Morris, M. K. Morris, L. R. Williams, W. D. Taylor, F. A. Hiatt, and S. C. Hern Jan. 1978 102 p refs Prepared in cooperation with Nevada Univ., Las Vegas
(PB-280140/5; EPA-600/3-78-015) Avail: NTIS HC A06/MF A01 CSCL 13B
The data report presents the species and abundance of phytoplankton in the 20 lakes sampled in the State of Ohio. Results from the calculation of several water quality indices are also included (Nygaard's Trophic State Index, Palmer's Organic Pollution Index, and species diversity and abudance indices).
GRA

N78-30805 Union Coll., Schenectady, N.Y.
THE ARTIFICIAL GILL: A STUDY OF ITS DEVELOPMENT, THEORY OF OPERATION, HUMANISTIC ASPECTS, AND DESIGN Ph.D. Thesis
Edgar Werner 1977 197 p
Avail: Univ. Microfilms Order No. 7811527
The artificial gill (or Agill) may be defined as a device by which a human being is enabled to exchange his metabolic gases (oxygen and carbon dioxide)in a liquid environment such as the sea, in essentially the same manner as in his normal air environment. The Agill is based on the principle that certain materials or compounds have the property of being permeable to those gases (or being solutes for them) while at the same time being impermeable to water. Dissert. Abstr.

N78-30807 Syracuse Univ., N. Y.
THE PSYCHOPHYSICAL TUNING CURVE: A PARAMETRIC STUDY Ph.D. Thesis
Charles Thomas Grimes 1977 142 p
Avail: Univ. Microfilms Order No. 7811652
The shape of psychophysical tuning curves under simultaneous masking as a function of three frequencies, three levels, and two durations of probe tones was investigated. Limited comparisons were made between the psychophysical tuning curves for three normal-hearing observers and one observer with hearing impairment of cochlear origin. The results indicate that the general shape of psychophysical tuning curves is consistent throughout the eighteen combinations of parameter vaules studied. These results are compared to previous investigations of psychophysical and neural tuning curves with respect to the specific effects of probe-tone parameter values on the shape of the curves. Irregularities in the shape of psychophysical tuning curves are discussed in relation to aural combination tones and other nonlinearities. The significance of psychophysical tuning curves as a measure of the quality of frequency selectivity in the impaired auditory system is also discussed. Dissert. Abstr.

N78-30808*# Florida Agricultural and Mechanical Univ., Tallahassee. School of Pharmacy.
REGULATION OF THE ADRENAL CORTEX FUNCTION DURING STRESS Annual Report
Karam F. A. Soliman 1 Sep. 1978 53 p refs
(Grant NsG-2183)
(NASA-CR-157397) Avail: NTIS HC A04/MF A01 CSCL 06S
A proposal to study the function of the adrenal gland in the rat during stress is presented. In the proposed project, three different phases of experimentation will be undertaken. The first phase includes establishment of the circadian rhythm of both brain amines and glucocoticoids, under normal conditions and under chronic and acute stressful conditions. The second phase includes the study of the pharmacokinetics of glucocorticoid binding under normal and stress conditions. The third phase includes brain uptake and binding under different experimental conditions. In the outlined experiments brain biogenic amines will be evaluated, adrenal functions will be measured and stress effect on those parameters will be studied. It is hoped that this investigation can explain some of the complex relationships between the brain neurotransmitter and adrenal function. Author

N78-30809# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
A GENERAL MYOCYBERNETIC CONTROL MODEL OF SKELETAL MUSCLE
H. Hatze Oct. 1977 47 p refs
(CSIR-SR-WISK-280; ISBN-0-7988-1214-1) Avail: NTIS HC A03/MF A01
A general myocybernetic control model of skeletal muscle is presented which constitutes an extension, to general control modes, of a previously published control model. The restriction, in the previous model, to a constant number of stimulated motor units was removed and the new model allowed for both a varying number of stimulated motor units and a varying average stimulation rate. The general model is tested by comparing its predictions with experimental records of the force output of the quadriceps femoris muscle. It is found that the model correctly predicts the initial excitation-contraction delay, the dips in the force record, and several other contraction phenomena. Author

N78-30810# IIT Research Inst., Chicago, Ill.
LASER-INDUCED THERMAL DAMAGE OF SKIN Final Report, Sep. 1976 - Apr. 1977
A. N. Takata, L. Zaneveld, and W. Richter Dec. 1977 159 p refs
(Contract F33615-76-C-0608; AF Proj. 7757)
(AD-A054612; IITRI-J6394; SAM-TR-77-38) Avail: NTIS HC A08/MF A01 CSCL 06/18
A computerized model was developed for predicting thermal damage of skin by laser exposures. Thermal, optical, and physiological data are presented for the model. Model predictions of extent of irreversible damage were compared with histologic determinations of the extent of damage produced in pig skin by carbon dioxide and ruby lasers. Author (GRA)

N78-30811# Defence Research Establishment Suffield, Ralston (Alberta).
EFFECT OF ATROPINE UPON THE CEREBROVASCULAR SYSTEM DURING GD-INDUCED RESPIRATORY DEPRESSION
J. A. Lipp and T. J. Dola Mar. 1978 15 p refs
(AD-A054807; DRES-TP-488) Avail: NTIS HC A02/MF A01 CSCL 15/2
The effect of GD-induced respiratory depression upon cerebral vascular physiology was studied in monkeys. There was a significant decrease in heart rate, mean arterial blood pressure, cerebral blood flow and cerebral perfusion pressure during the onset of respiratory depression, which terminated as apnea. Administration of atropine resulted in an immediate increase in

all of the above mentioned parameters which coincided with improvement in respiration. It was concluded that GD impaired cerebral autoregulation, which resulted in a decrease in cerebral blood flow and cerebral perfusion pressure. It was suggested that respiratory depression resulted, in part, from anoxia. Administration of atropine increased the cerebral blood flow and cerebral perfusion pressure, which, in turn, possibly reversed the anoxic conditions resulting in the improvement of respiration.
Author (GRA)

N78-30812# Illinois Univ. at the Medical Center, Chicago.
EFFECTS OF NOISE AND HEARING ACUITY UPON VISUAL DEPTH PERCEPTION AND SAFETY AMONG HUMANS Final Report
Edward R. Hermann. Apr. 1978. 41 p. refs. Sponsored by Illinois Inst. for Environ. Quality.
(Proj. 30.011)
(PB-280365/8; IIEQ-77-10) Avail: NTIS. HC A03/MF A01. CSCL 06S

Exposure to steady-state broad-band, high-intensity noise ranging from 70 dbA to 115 dbA for time periods of several minutes did not produce significant changes in visual depth perception errors. Any error in stereoscopic depth perception produced by exposure of humans to broad-band white noise between 70 and 115 dbA is so small that such a perturbation is inadequate for establishing community or occupational noise standards. Other criteria are more important. GRA

N78-30813# Permanent Commission and International Association of Occupational Health. Subcommittee on the Toxicology of Metals.
TOXICOLOGY OF METALS, VOLUME 3
Feb. 1978. 308 p. refs. Prepared in cooperation with National Swedish Environment Protection Board, and Karolinska Institutet.
(Contract EPA-68-02-287)
(PB-280115/7; EPA-600/1-78-016) Avail: NTIS. HC A14/MF A01. CSCL 06T

Contents: general chemistry of metals; sampling and analytical methods; sources, transport, and transformation of metals in the environment; effects-general principles underlying the toxic-action of metals; factors influencing effects and dose-response relationships of metals; epidemiological aspects of assessment of dose-response and dose-effect relationships; general aspects of the prevention of metal poisoning; general aspects and specific data on ecological effects of metals; standards and criteria; clinical effects, diagnosis and treatment of metal poisoning-general considerations; mutagenic and carcinogenic effects of metals. GRA

N78-30814# Yugoslav Academy of Sciences and Arts, Zagreb. Inst. for Medical Research and Occupational Health.
BIOLOGICAL SIGNIFICANCE OF SOME METALS AS AIR POLLUTANTS. PART 2: MERCURY Final Report, Jan. 1969 - Jan. 1974
Mirka Fugas, Fedor Valic (Zagreb Univ., Yugoslavia), and Andrija Stampar (Zagreb Univ. Yugoslavia). Jan. 1978. 193 p. refs.
(Contract SFCP-02-302-3)
(PB-279670/4; EPA-600/1-78-002) Avail: NTIS. HC A09/MF A01. CSCL 06T

The association is considered between low atmospheric mercury levels and changes in some biological parameters likely to react to such exposures. The study covered four populations believed to be exposed to four different levels of atmospheric mercury: rural inhabitants, town dwellers, population from a mercury mining and smelting town, and workers occupationally exposed to mercury. It is concluded that mercury exposure is likely to induce changes in the activity of cholinesterase, alkaline phosphatase, and glucose-6-phosphate dehydrogenase and also to cause changes in the concentration of coproporphyrin and probably glutathione. GRA

N78-30815# National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, Bethesda, Md.
TRANSCRIPTS OF THE 40TH MEETING PROCEEDINGS OF NATIONAL COMMISSION FOR THE PROTECTION OF HUMAN SUBJECTS OF BIOMEDICAL AND BEHAVIORAL RESEARCH
Mar. 1978. 273 p. refs. Meeting held at Bethesda, Md., 10-11 Mar. 1978; sponsored by HEW.
(PB-279916/1; NCPHS/M-78/03) Avail: NTIS. HC A12/MF A01. CSCL 06E

The edition is a transcript of the March 10-11, 1978 meeting of the National Commission for the Protection of Human Subjects. Commission members discussed the following topics: (1) proposed sterilization regulations, (2) ethical principles and guidelines for research involving human subjects, (3) institutional review boards, and (4) protection of patients receiving health services in DHEW programs. GRA

N78-30816# National Technical Information Service, Springfield, Va.
HYPOTHERMIA. A BIBLIOGRAPHY WITH ABSTRACTS Final Report, 1964 - Apr. 1978
Elizabeth A. Harrison. Jun. 1978. 233 p. Supersedes NTIS/PS-77/0419; NTIS/PS-76/0398
(NTIS/PS-78/0517/9; NTIS/PS-77/0419; NTIS/PS-76/0398) Avail: NTIS. HC $28.00/MF $28.00. CSCL 06S

The selected abstracts cover high pressure narcosis, organ preservation, hyperbaric conditions, thermal homoeostasis, thermoregulation, cold stress, cold tolerance, physiological effects and cold water immersion as related to hypothermia. (This updated bibliography contains 227 abstracts, 22 of which are new entries to the previous edition.) GRA

N78-30817# National Inst. for Personnel Research, Johannesburg (South Africa).
MAN-ENVIRONMENT STUDIES: A REVIEW WITH AN ANALYSIS OF SOME TECHNIQUES FOR THE ASSESSMENT OF ENVIRONMENTAL PERCEPTION
S. Kushlick. Sep. 1977. 58 p. refs.
(CSIR-SR-PERS-271; ISBN-0-7988-1180-3) Avail: NTIS. HC A04/MF A01

Man-environment studies with its resultant diversity of approaches and priorities are examined. These phenomena are classified into three main areas: (1) attitudes and values, (2) spatial behavior, and (3) adaptation of persons within a particular environmental setting. Methodological issues are summarized. Exploratory studies with three measurement techniques, (semantic differential, time-budgets, and cognitive mapping) which deal with the environment as it is experienced by the respondent are discussed. Consideration of the relevance of these techniques for environmental perceptual studies in general, and a South African population in particular, is incorporated in the discussions. S.E.S.

N78-30818# Civil Aeromedical Inst., Oklahoma City, Okla.
USE OF THE OCCUPATIONAL KNOWLEDGE TEST TO ASSIGN EXTRA CREDIT IN SELECTION OF AIR TRAFFIC CONTROLLERS
Mary A. Lewis. Feb. 1978. 12 p. refs.
(AD-A053675; FAA-AM-78-7) Avail: NTIS. HC A02/MF A01. CSCL 05/9

The Occupational Knowledge Test (OKT) 101-B was administered to 784 air traffic control trainees who entered the FAA Academy's 16 week training course in 1976. All trainees completed the nonradar laboratory portion of the training and in addition completed a preemployment questionnaire. Based on responses to the questionnaire, the trainees were assigned to one of three experience groups corresponding to groups given credit for experience using Civil Service Commission (CSC) selection procedures. It was found that the OKT was highly correlated with experience ($r = .64$) and in addition the OKT had a higher correlation with successful completion of the nonradar lab than did experience ($r = .25$ vs .12). It was determined that use of an OKT score of 75 or above to assign extra credit would result in a failure rate of 3.1 percent for those receiving credit, while use of the current experience scale would result in a failure rate of 7.6 percent for those receiving extra credit on the CSC selection battery. The results held up for a cross-validation sample of 432 trainees who the Academy during 1977. Based

on the results, it is recommended that an OKT score of 75 or above be used to assign extra credit for experience in the selection of air traffic controllers. Author

N78-30819# Council for Scientific and Industrial Research, Pretoria (South Africa). Dept. of Technical Services.
INSTRUMENTATION FOR THE MEASUREMENT OF THE EVAPORATIVE AND RADIATIVE HEAT LOSS RATES FROM MAN IN A NORMAL WORKING MODE
T. Hodgson 1977 22 p refs Presented at the Intern. Conf. on Bioeng., Cape Town, Apr. 1977
Avail: NTIS HC A02/MF A01

Instrumentation that was developed for the direct measurement of the evaporative and radiative heat transfer rates between the human body in a natural working position and his environment in a 3 m x 3 m x 3 m test chamber with horizontal air flow is described. The evaporative heat loss measuring system incorporates a relatively simple albeit extremely sensitive differential hygrometer for detecting the humidity increase in the wake of the subject and a unique calibration system which involves the introduction of a known amount of steam into the wake of the body. The differential hygrometer is capable of detecting increases in specific humidity in the wake of the evaporating body as small as 4 x .000001 kg/kg. The radiation measuring system is in the form of a relatively thin rotating hoop; the inside and outside surfaces of the hoop being lined with thermal radiation sensing elements so connected as to measure the net radiation energy exchange between the subject and its surroundings. Full-scale tests involving the use of the instrumentation are referred to. Author

N78-30820*# General Electric Co., Schenectady, N. Y.
URINE MONITORING SYSTEM FAILURE ANALYSIS AND OPERATIONAL VERIFICATION TEST REPORT Final Report
E. J. Glanfield 22 Aug. 1978 63 p
(Contract NAS9-15230)
(NASA-CR-151828) Avail: NTIS HC A04/MF A01 CSCL 06B

Failure analysis and testing of a prototype urine monitoring system (UMS) are reported. System performance was characterized by a regression formula developed from volume measurement test data. When the volume measurement test data. When the volume measurement data was imputted to the formula, the standard error of the estimate calculated using the regression formula was found to be within 1.524% of the mean of the mass of the input. System repeatability was found to be somewhat dependent upon the residual volume of the system and the evaporation of fluid from the separator. The evaporation rate was determined to be approximately 1cc/minute. The residual volume in the UMS was determined by measuring the concentration of LiCl in the flush water. Observed results indicated residual levels in the range of 9-10ml, however, results obtained during the flushing efficiency test indicated a residual level of approximately 20ml. It is recommended that the phase separator pumpout time be extended or the design modified to minimize the residual level. J.M.S.

N78-30821*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A SEAT CUSHION TO PROVIDE REALISTIC ACCELERATION CUES FOR AIRCRAFT SIMULATOR PILOTS Patent Application
Billy R. Ashworth, inventor (to NASA) Filed 26 Jul. 1978 15 p
(NASA-Case-LAR-12149-2; US-Patent-Appl-SN-928131) Avail: NTIS HC A02/MF A01 CSCL 04H

A seat cushion for providing realistic acceleration cues to aircraft simulator pilots is presented. The novel feature of the invention appears to lie in the simulation of the events that happen in a seat cushion during actual flight to impact acceleration cues to the pilot. Also the novel controller has the ability to control the air pressure with sufficient response time and smoothness to adequately drive the seat cushion. Prior controllers were unable to adequately do this. NASA

N78-30822# School of Aerospace Medicine, Brooks AFB, Tex.
MOLECULAR SIEVE GENERATION OF AVIATOR'S OXYGEN: BREATHING GAS COMPOSITION AS A FUNCTION OF FLOW, INLET PRESSURE, AND CABIN ALTITUDE Interim Report, 1 Oct. 1976 - 30 Sep. 1977
Richard L. Miller, Clarence F. Theis, Roger L. Stork, and Kenneth G. Ikels Dec. 1977 28 p refs
(AF Proj. 7930)
(AD-A054240; SAM-TR-77-40) Avail: NTIS HC A03/MF A01 CSCL 01/3

The molecular sieve method of generating an enriched-oxygen breathing gas is one of three candidate on-board oxygen generation (OBOG) systems under joint Navy-Air Force development for application in tactical aircraft. As part of this program, the performance of a nominal 2-man-capacity molecular sieve oxygen generation system (MSOG) was characterized under simulated flight conditions. Data were given on the composition (oxygen, nitrogen, carbon dioxide, and argon) of the MSOG-generated breathing gas as a function of inlet air pressure, altitude, and gas flow rate. The maximum oxygen concentration observed was 95% with the balance argon. Under certain conditions of pressure, altitude, and flow, the argon enrichment factor exceeded that of oxygen giving a maximum argon concentration of 6.4% with the balance oxygen. The performance of the MSOG was discussed in the context of aircraft operating envelopes using both diluter-demand and 100% delivery subsystems.
Author (GRA)

N78-30823# School of Aerospace Medicine, Brooks AFB, Tex.
PRELIMINARY ANALYSIS OF AVAILABLE INFLIGHT RESPIRATORY DATA Interim Report, Jan. 1976 - May 1977
Thomas R. Morgan, F. Wesley Baumgardner, Joseph C. Crigler, Donald H. Reid, and Melvin A. Tays Dec. 1977 11 p refs
(AF Proj. 7930)
(AD-A054241; SAM-TR-77-20) Avail: NTIS HC A02/MF A01 CSCL 06/16

Pulmonary ventilation of aircrew members has been measured in 22 missions of C-130, T-38, A-4, F-4, and F-14 aircraft. Data were obtained by means of an inflight physiologic monitoring device which provides continuous simultaneous recording of expiratory flow, electrocardiograph, cabin pressure, acceleration, voice, and time code signals. This effort is the first wherein it has been possible to continuously track pilot respiratory needs and identify both the extent and frequency of variation from the mean. Although minute ventilations which were measured most frequently occurred in the range of previously published averages, a significant portion of the data exhibited higher levels. These higher levels generally corresponded with the performance of specific flight tasks. It is recommended that future oxygen system design requirements take into account these routinely encountered higher levels of ventilation. Author (GRA)

N78-30824# Rockwell International Corp., Anaheim, Calif. Autonetics Group.
ANALYSIS OF CREW/COCKPIT MODELS FOR ADVANCED AIRCRAFT
Charles P. Greening Feb. 1978 59 p refs
(Contract N00123-74-C-0236; WF55525000)
(AD-A054957; NWC-TP-6020) Avail: NTIS HC A04/MF A01 CSCL 09/2

The purpose of this study was to examine five active computer models of the aircrew/cockpit system, and to determine their relevance to current and future attack aircraft. The models were compared in terms of their general structure, input requirements, output options, and their sensitivity to a wide variety of equipment, mission, and operator characteristics. The models reviewed are similar in several important respects. They all require a detailed mission scenario and tesk analysis to steer the simulation; all require data on performance time and accuracy as inputs; and all generate outputs related to operator task load. The models differ widely in their sensitivity to significant variables. Recommendations for future work are presented. Author (GRA)

N78-30825# Naval Air Engineering Center, Lakehurst, N.J. Dept. of Ground Support Equipment.

RELIABILITY TEST REPORT. MODULAR CRYOGENIC GENERATOR Final Technical Report

R. Ferret 27 Apr. 1978 82 p refs

(AD-A054855; NAEC-92-124) Avail: NTIS HC A05/MF A01 CSCL 06/11

Reliability Testing of the LOX-30 Liquid Oxygen Plant was evaluated in accordance with MIL-STD-781. Reliability Tests were divided into Environmental Requirements, Reliability Growth and Reliability Demonstration Tests. Accept/reject criteria for the demonstration test was a specified MTBF of 1900 hours at the 30% risk level which was met. Four non-relevant failures occurred but had minor effect on the LOX-30 system. A failure distribution was established for the electro-pneumatic solenoid valves to be Log-normal. Author (GRA)

N78-30826# Southern Research Inst., Birmingham, Ala.

STUDY OF REACTIVE MATERIALS FOR DEVELOPMENT OF NEW PROTECTIVE CLOTHING CONCEPTS Final Report, 11 Nov. 1976 - 10 Nov. 1977

Donald R. Cowsar, Danny H. Lewis, and Gary W. Whitehead Jan. 1978 45 p refs

(Contract DAAA15-77-C-0015)

(AD-A054877; AD-E410022; SORI-3808-4; ARCSL-CR-78023) Avail: NTIS HC A03/MF A01 CSCL 15/2

This report describes investigations of reactive materials suitable for incorporation in or on fabrics for protection from percutaneous chemical warfare agents. Microencapsulated forms of alkali metal hydroxides and aliphatic amines were developed and found to be unsuitable for protection from HD. Aqueous solutions of aliphatic amines containing 4-(N,N-dimethylamino) pyridine were found to destroy GB on contact. Microcapsules comprising granules of stabilized XXCC3 in ethyl cellulose walls were found to react readily with HD. These microcapsules were bonded to 8 oz sateen fabric with resin binders, and the permeation of HD vapor through the fabric was determined. At contamination densities of 2.4 gm/sq m the HD vapor penetration was found to be 6 micrograms/sq cm. The treated fabrics were tested for stability toward washing and ultraviolet irradiation, and no change in agent vapor penetration was observed for either the washed samples or those subjected to irradiation for the equivalent of 1800 hours of sunlight. Author (GRA)

N78-31689 California Univ., Berkeley.

THE EFFECT OF HIGH ALTITUDE ON PYRIDINE NUCLEOTIDES AND ADENOSINE PHOSPHATES IN THE LIVER OF THE RAT Ph.D. Thesis

Ronald Dawson Reed 1977 144 p

Avail: Univ. Microfilms Order No. 7812746

The effects of hypoxia on cellular oxidation-reduction (redox) status energy status in rat liver tissue were investigated. Alterations in redox status were observed by a direct measurement of total cellular pyridine nucleotides--nicotinamide adenine dinucleotides and nicotinamide adenine dinucleotide phosphates and subsequent calculation of their redox ratios. Additional examination of cytoplasmic redox status was made through a determination of the concentrations of lactate, pyruvate, alpha-glycerophosphate, and dihydroxyacetone phosphate. Phosphate bond energy status was examined by analyses of adenosine triphosphate, adenosine diphosphate and adenosine monophosphate. The results emphasize the importance of exygen as the ultimate electron acceptor of the cell. With hypoxia the partial pressure of oxygen falls at the cellular level, resulting in an increased redox status and a decreased energy status. Dissert. Abstr.

N78-31690*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

DIGITAL ENHANCEMENT OF COMPUTERIZED AXIAL TOMOGRAMS

Ernest Roberts, Jr. 1978 6 p refs Presented at the 5th Ann. Computers in Cardiology Conf., Stanford, Calif., 12-14 Sep. 1978; cosponsored by IEEE, NIH, and Stanford Univ. School of Med.

(NASA-TM-78974; E-9748) Avail: NTIS HC A02/MF A01 CSCL 06E

A systematic evaluation was conducted of certain digital image enhancement techniques performed in image space. Three types of images were used, computer generated phantoms, tomograms of a synthetic phantom, and axial tomograms of human anatomy containing images of lesions, artificially introduced into the tomograms. Several types of smoothing, sharpening, and histogram modification were explored. It was concluded that the most useful enhancement techniques are a selective smoothing of singular picture elements, combined with contrast manipulation. The most useful tool in applying these techniques is the gray-scale histogram. L.S.

N78-31691*# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Biology.

THE 70 S MONOSOME ACCUMULATION AND IN VITRO INITIATION COMPLEX FORMATION BY ESCHERICHIA COLI RIBOSOMES AT 5 C Ph.D. Thesis

Robert J. Broeze and Daniel H. Pope [1978] 33 p refs

(Grant NsG-7345)

(NASA-CR-157591) Avail: NTIS HC A03/MF A01 CSCL 06C

The inhibition of translation which is observed after shifting Escherichia coli to low temperature was investigated. 70 S ribosomes were isolated from E. coli 8 hours after a shift to 5 C synthesized protein in the absence of added mRNA (i.e., endogenous protein synthesis by 70 S monosomes) at a rate which was three times greater than the rate of endogenous protein synthesis by 70 S ribosomes which were isolated at the time of the shift to 5 C. Calculations based on the rates of endogenous protein synthesis and polyphenylalanine synthesis indicate that 70 S monosomes comprise only 0.1% of the total E. coli 70 S ribosome population after 8 hours at 5 c. Experiments designed to test initiation complex formation on ApUpG or formaldehyde treated MS-2 viral RNA demonstrated that, although the rate of formation of 30 S initiation complexes was not inhibited, the rate of formation of active 70 S initiation complexes, able to react with puromycin, was inhibited to a great extent at 5 C. A model depicting the effects of low temperature on the E. coli translation system is proposed. Author

N78-31692# Professional Staff Association of Los Angeles County/-Univ. of Southern California Medical Center, Los Angeles.

BEHAVIOR, ECOLOGY AND TOXICITY OF VENOMOUS MARINE FISHES Final Technical Report, 1 Oct. 1975 - 31 Dec. 1977

Findlay E. Russell 31 Dec. 1977 10 p refs

(Contract N00014-76-C-0254)

(AD-A054925) Avail: NTIS HC A02/MF A01 CSCL 06/20

The writer has been studying the general biology of certain venomous marine fishes of nuisance importance to Navy personnel; the chemistry and electron microscope appearance of the skin of certain fishes recently found to be toxic; the ultrastructure of the venom apparatus of the stingrays and scorpion fishes; the chemistry and pharmacology of stingray and scorpionfish venom. Work on the chemistry of California scorpion fish venom indicate that sulfhydryl groups are required for the lethal activity of the venom. Cystine and reduced glutathione appear to have no significant effect on this activity until several days have passed. Cleland's reagent, an effective sulfhydryl reagent, stabilizes the lethal activity. The lethal activity is sensitive to heat, oxidizing agents and extremes of concentration and pH. The venom contains nonsignificant amounts of proteolytic and phosphodiesterase activity. When the crude venom is fractionated by gel filtration chromatography, the lethal activity is associated with proteins having a molecular weight of more than 40,000 and would seem to have a molecular weight of less than 2,000,000. Following separation on Sephadex G-200, the semi-purified lethal fraction has an IV LD sub 50 in mice of 0.9 mg/protein/kg body weight, while the LD sub 50 of the crude venom is 2.6 mg/protein/kg. GRA

N78-31693# National Technical Information Service, Springfield, Va.

BIONICS. A BIBLIOGRAPHY WITH ABSTRACTS Final Report, 1970 - Apr. 1978

George W. Reimherr Jun. 1978 118 p Supersedes NTIS/PS-77/0413; NTIS/PS-76/0370; NTIS/PS-75/396; COM-73-11718

(NTIS/PS-78/0550/0; NTIS/PS-77/0413; NTIS/PS-76/0370; NTIS/PS-75/396; COM-73-11718) Avail: NTIS HC $28.00/MF $28.00 CSCL 06D

Recent advances in visual information processing, electronic models of nerve cells, and biological sonar systems are discussed in these citations. Theory and applications are included, along with computerized simulation and signal processing. Electrophysiology and modelling of the central nervous system are also included. (This updated bibliography contains 112 abstracts, 17 of which are new entries to the previous edition.) GRA

N78-31694# Joint Publications Research Service, Arlington, Va.

TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY: BIOMEDICAL AND BEHAVIORAL SCIENCES, NO. 35

14 Jul. 1978 120 p refs Transl. into ENGLISH from various Russian documents

(JPRS-71467) Copyright. Avail: NTIS HC A06/MF A01

Articles are presented dealing with the development of the space suit and the presence of electroreceptors in man.

N78-31695# Joint Publications Research Service, Arlington, Va.

EVOLUTION OF THE SPACE SUIT

V. B. Malkin and I. N. Chernyakov *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 35 (JPRS-71467) 14 Jul. 1978 p 1-7 Transl. into ENGLISH from Zdorovye (Moscow), no. 4, 1978 p 7-8

Copyright. Avail: NTIS HC A06/MF A01

Features of the space suit developed for use in the spacecraft and during extravehicular activity are described. These include: (1) permits normal respiration; (2) maintains oxygen pressure in the lungs; (3) regeneration of oxygen and absorption of carbon dioxide; (4) flexibility; and (5) heat exchange through ventilation and water cooling systems. J.M.S.

N78-31696# Joint Publications Research Service, Arlington, Va.

ELECTRORECEPTORS IN MAN AND OTHER ANIMALS

O. B. Ilinskiy *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 35 (JPRS-71467) 14 Jul. 1978 p 56-59 refs Transl. into ENGLISH from Zdorovye (Moscow), no. 4, 1978 p 12-13

Copyright. Avail: NTIS HC A06/MF A01

The electroreceptor systems of fish, specifically the shark and the ray, are examined. It is shown that vertebrate animals with electroreceptor systems perceive electrical and magnetic stimuli in the environment. It is hypothesized that man has some sort of specialized receptor structures capable of perceiving electrical and magnetic stimuli in the environment. J.M.S.

N78-31697# Joint Publications Research Service, Arlington, Va.

TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY: BIOMEDICAL AND BEHAVIORAL SCIENCES, NO. 39

28 Jul. 1978 96 p refs Transl. into ENGLISH from various Russian journals

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Articles are presented dealing with genetics, industrial toxicology, bioinstrumentation, and radiology.

N78-31698# Joint Publications Research Service, Arlington, Va.

GENETICS OF MICROORGANISMS AND MEDICINE

V. D. Timakov and N. F. Gamaleya *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 39 (JPRS-71569) 28 Jul. 1978 p 25-40 refs Transl. into ENGLISH from Zh. Obshch. Biol. (Moscow), no. 3, 1978 p 335-346 Presented at the All-Union Soc. of Geneticists and Breeders, Leningrad, May 1977

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Medical aspects of genetic research pursued on microorganisms are discussed. Data are submitted on genetic control of virulence and toxic production of bacteria. Genetic and biochemical research dealing with catabolite repression and mechanisms of repair of DNA injuries induced by radiation and chemical agents are analyzed. The role of genetics of microorganisms in development of general genetics and formation of the new molecular genetics direction in biology is discussed. The objectives of research on genetics of microorganisms of basic importance to both medicine and learning general biological laws are formulated. J.M.S.

N78-31699# Joint Publications Research Service, Arlington, Va.

SOME PRESSING PROBLEMS OF GENETICS

N. P. Dubinin *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 39 (JPRS-71569) 28 Jul. 1978 p 41-52 refs Transl. into ENGLISH from Zh. Obshch. Biol. (Moscow), no. 3, 1978 p 347-356 Presented at the 3d Congr. of the All-Union Soc. of Geneticists and Breeders, Leningrad, May 1977

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The main advances and tasks confronting the scientific direction of genetics are formulated. The role of genetics in mobilizing food and raw material resources, genetics and medicine, the problem of environmental mutagens, social and biological aspects of the problem of man, and genetic engineering are covered. J.M.S.

N78-31702# Joint Publications Research Service, Arlington, Va.

A VARIANT OF PORTABLE SINGLE-CHANNEL BIORADIO-TELEMETRY SYSTEM

A. A. Shaptala, V. S. Sautkin, and V. V. Zabrodin *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 39 (JPRS-71569) 28 Jul. 1978 p 64-66 ref Transl. into ENGLISH from Gig. Tr. (Moscow), no. 6, 1978 p 56-58

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Development of a relatively simple, reliable, single-channel system for FM-FM dynamic radiotelemetry of electrophysiological and nonelectrophysiological indexes is described. The system is limited to the frequency band of 0.2-300 Hz and amplitude of 0.0-10 mV. J.M.S.

N78-31703# Joint Publications Research Service, Arlington, Va.

A METHOD OF RECORDING HEAT PARAMETERS OF DIVERS DURING WORK

A. V. Sterlikov *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 39 (JPRS-71569) 28 Jul. 1978 p 67-69 Transl. into ENGLISH from Gig. Tr. (Moscow), no. 6, 1978 p 55-56

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A device designed to permit successive transmission of data from 12 temperature sensors over only two wires, to avoid inconveniences in recording the parameters of a diver's thermal status, is described. The communicating device was used to take information from the sensors of skin temperature, sublingual temperature, temperature under the clothing, and ambient water temperature when pursuing studies of heat exchange when a diver is working under water. J.M.S.

N78-31704# Joint Publications Research Service, Arlington, Va.

DEPENDENCE OF THE REACTION OF THE HUMAN NERVOUS SYSTEM ON THE DISTRIBUTION OF ABSORBED DOSES OF IONIZING RADIATION

G. I. Kirsanova *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 39 (JPRS-71569) 28 Jul. 1978 P 76-84 refs Transl. into ENGLISH from Med. Radiol. (Moscow), no. 5, 1978 p 3-8

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The nervous system was found to react in unique ways in observations of large occupational groups working in the presence

of chronic radiation and characterized by different distributions of absorbed energy in the human body. Concrete cases of acute radiation exposure are used to demonstrate the typical clinical manifestations of the affliction of the nervous system depending on distribution of absorbed energy in brain tissues. J.M.S.

N78-31705# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY: BIOMEDICAL AND BEHAVIORAL SCIENCES, NO. 40. EFFECTS ON NONIONIZING ELECTROMAGNETIC RADIATION
1 Aug. 1978 51 p refs Transl. into ENGLISH from various Russian journals
(JPRS-71595) Copyright. Avail: NTIS HC A04/MF A01

Articles are presented concerning the biological effects of electromagnetic fields, steady magnetic fields, and electric fields. Topics discussed include: Coagulation of blood and tissues of the cardiovascular system after prolonged exposure to electromagnetic fields; influence of superhigh intensity steady magnetic fields on bone marrow cells; ecological effects of high voltage electric power lines; and survey of research on biological effects of magnetic fields.

N78-31706# Joint Publications Research Service, Arlington, Va.
COAGULATIVE PROPERTIES OF BLOOD AND TISSUES OF THE CARDIOVASCULAR SYSTEM IN EXPOSURE TO ELECTROMAGNETIC FIELDS
V. Ye. Kuksinskiy *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 40 (JPRS-71595) 1 Aug. 1978 p 1-7 refs Transl. into ENGLISH from Kardiologiya (Moscow), no. 3, 1978 p 107-110

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Albino rats were exposed to prolonged action of a low frequency electromagnetic field on recalcification time, tolerance of plasma for heparin, consumption of prothrombin, thrombin time, and fibrinolysis. Results are presented in a table. It is concluded that: (1) a phase nature of changes in the coagulation properties of the heart and aorta is observed; (2) irradiation of rats by an electromagnetic field for 8 days is accompanied by an increase in the coagulating and fibrinolytic activity of the blood with a simultaneous inhibition of the thromboplastic compounds of the heart and cardiac wall; and (3) an increase in length of exposure to 20 days results in inactivation of both the tissue and the plasma factors in blood coagulation and fibrinolysis. J.M.S.

N78-31707# Joint Publications Research Service, Arlington, Va.
PROLIFERATION OF BONE MARROW CELLS UNDER THE INFLUENCE OF SUPERHIGH INTENSITY STEADY MAGNETIC FIELDS
A. D. Strzhizhovskiy and G. V. Galaktionova *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 40 (JPRS-71595) 1 Aug. 1978 p 8-12 refs Transl. into ENGLISH from Tsitologiya (Leningrad), no. 6, 1978 p 717-720

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The effects of 9.9-42.4 kOe steady magnetic fields (SMF) with an intensity gradient of 0.2-3.5 kOe/cm for 0.5-24 h on mitotic activity and quantity of bone marrow cells in mice was studied. It was demonstrated that brief exposure stimulates mitotic activity and long exposure depresses it; the severity of depression was directly related to intensity and intensity gradient of SMF. The longer the exposure and the higher the intensity of SMF, the slower the rate of restoration of mitotic index to the base level after exposure. In those cases where inhibition of mitotic activity is the most marked, a decrease in number of bone marrow cells was observed. No increase in incidence of aberrant mitoses in bone marrow cells was observed under the influence of SMF. J.M.S.

N78-31708# Joint Publications Research Service, Arlington, Va.
POSSIBILITY OF ATTENUATING THE ECOLOGICAL EFFECTS OF ALTERNATING CURRENT POWER LINES AS A RESULT OF NEW DESIGNS AND CIRCUIT CHANGES
V. M. Postolatiy and S. P. Putyatin *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 40 (JPRS-71595) 1 Aug. 1978 p 13-22 refs Transl. into ENGLISH from Izv. Akad. Nauk Moldavsk. SSR, Ser. Friz.-Tekh. i Mat. Nauk (Kishinev), no. 1, 1978 p 73-79

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The possibility of lowering the ecological effects of single and double circuit alternating current electric power lines by means of approximating phases is discussed. With respect to multicircuit electric power lines, reduction of interphase and intercircuit distances is considered in combination with a change in phase shift of triple phase voltage systems applied to the circuits, with different combinations of magnitude. J.M.S.

N78-31709# Joint Publications Research Service, Arlington, Va.
MAGNET EFFECTS IN BIOLOGY
M. M. Vilenchik *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 40 (JPRS-71595) 1 Aug. 1978 p 23-48 refs Transl. into ENGLISH from Usp. Sovrem. Biol. (Moscow), v. 63, no. 1, 1967 p 54-71

Copyright. Avail: NTIS HC A04/MF A01

Research on the biological effects of steady magnetic fields is surveyed. Topics covered include: directional effects; changes in reflex activity; magnetotropism; functional and morphological changes; changes in radiation effects; inhibition of tumor growth; and genetic effects. It is noted that research has focused on the biological effects of steady magnetic fields in animals, however, several experimental investigations into the effects of magnetic fields on physiological processes in the human body are cited. J.M.S.

N78-31710 Stanford Univ., Calif.
DIAGNOSTIC IMPROVEMENTS IN MEDICAL ULTRASONIC IMAGING SYSTEMS Ph.D. Thesis
David Henry Dameron 1978 155 p
Avail: Univ. Microfilms Order No. 7814165

Four separate topics are discussed, all related to improvements in medical ultrasonic imaging systems. The first two, concerning acoustic lens and reflector systems are very similar, the former using refraction, the latter reflection in order to produce pulse-echo images. The third topic, magnetostrictive imaging systems, is a new emissive ultrasonic imaging technique which uses electromagnetic waves for transmission and normal ultrasonic pulse-echo systems for reception. The last topic is a description of a tissue model where the spatial parameters vary continuously, instead of being piece-wise constant. Dissert. Abstr.

N78-31711 Minnesota Univ., Minneapolis.
FACTORS DETERMINING MAXIMAL EXPIRATORY FLOWS IN THE HUMAN LUNG Ph.D. Thesis
Ephraim Bar-Yishay 1978 229 p
Avail: Univ. Microfilms Order No. 78-13378

Expiratory flow from the lung increases with increasing effort up to a maximum beyond which flow is independent of driving pressure. Maximal expiratory flow is thought to depend primarily on the mechanical properties of the airways, the flow resistance in the lung periphery, and lung tissue viscous resistance. The results are presented of an experimental examination of some of the properties of the human lung which are significant in determining maximal expiratory flow; namely the geometry and compliance of the central airways and dynamic lung recoil. In addition, a computational model for maximal expiratory flow which incorporates the experimental data is presented. Flow predictions based on the observed dynamic pressure-volume relationship are found to be in better agreement with the actual flows than those predicted using the static pressure-volume relationship. Dissert. Abstr.

N78-31713*# Oregon Univ. Health Sciences Center, Portland. Dept. of Neurology.
ANALYTICAL STUDY OF ELECTROPHORETIC CHARACTERIZATION OF KIDNEY CELLS Final Report, 6 Aug. 1976 - 5 Jun. 1978
Robert J. Knox 16 Aug. 1978 67 p refs
(Contract NAS8-32162)
(NASA-CR-150790) Avail: NTIS HC A04/MF A01 CSCL 06A

Embryonic kidney cells were studied as a follow-up to the MA-011 Electrophoresis Technology Experiment which was conducted during the Apollo Soyuz Test Project (ASTP). The postflight analysis of the performance of the ASTP zone electrophoresis experiment involving embryonic kidney cells is reported. The feasibility of producing standard particles for electrophoresis was also studied. This work was undertaken in response to a need for standardization of methods for producing, calibrating, and storing electrophoretic particle standards which could be employed in performance tests of various types of electrophoresis equipment. Promising procedures were tested for their suitability in the production of standard test particles from red blood cells. J.M.S.

N78-31714*# Pennsylvania Univ., Philadelphia. Inst. for Environmental Medicine.
WORK CAPABILITY AND PHYSIOLOGICAL EFFECTS PREDICTIVE STUDIES. 4: IN He-O2 EXCURSIONS TO PRESSURES OF 400- 800- 1200- AND 1600 FEET OF SEA WATER
C. J. Lambertsen, ed., R. Gelfand, ed., J. M. Clark, ed., and M. E. Fletcher, ed. 1978 624 p refs
(Grant NsG-9011; Contracts N00014-67-A-0216-0026; N00014-67-A-0216-0037; N00014-75-C-1124; Grant HC-08899-11)
(NASA-CR-157571; Rept-78-1) Avail: NTIS HC A99/MF A01 CSCL 06E

Experiments which exposed men in chambers, breathing helium with oxygen, to progressive increases of pressure equivalent to 400-800-1200-1600 feet of sea water (fsw) were conducted. Rates of compression and exposure to stable high pressure. Goals included: 1) determination of the specific character and time course of onset of physiological and performance decrements during the intentionally rapid compressions, and determination of rates of adaptation on reaching stable elevated pressure; 2) investigation of accelerated methods for decompression in deep saturation excursion diving; and 3) determination of competence in practical work performed in water at pressures equivalent to the extreme diving depths of 1200 and 1600 fsw. Author

N78-31715# Army Environmental Hygiene Agency, Aberdeen Proving Ground, Md.
TOXICOLOGICAL EVALUATION OF PYRETHRINS FOGGING CONCENTRATE (TRADE NAME) STUDY NO. 51-1309-78 Final Report, Jul. 1976 - Jun. 1977
Joseph A. Macko, Jr., LeRoy W. Metker, Perry J. Kurtz, and K. Clark Swentzel Jun. 1977 49 p refs
(AD-A055088; USAEHA-51-1309-78) Avail: NTIS HC A03/MF A01 CSCL 06/20

A toxicological evaluation of Pyrethrins Fogging Concentrate and its ingredients was conducted by this Agency. One and four hour single inhalation aerosol exposures were performed on rats and rabbits. Transient toxic signs (red exudate around the eyes and nose) were observed in animals exposed to APCO 467 for 1 hour at 4.7 mg/1 and for 4 hours at 1.3 mg/1, and also to Pyrocide for 4 hours at 1.4 mg/1. No histological lesions attributable to the inhalation of Pyrethrins Fogging Concentrate or its ingredients were detected in rats necropsied 14 days post exposure. The results of behavioral tests indicate that exposure to high concentrations (4.7 mg/1) of APCO-467 for 1 hour or lower concentrations (1.3 mg/1) for 4 hours impaired rat avoidance performance for almost 24 hours. Pulmonary function tests indicate possible transitory lung irritation in rabbits exposed to Pyrocide-175, APCO-467 and MGK-264. Data indicate that the compound is nonmutagenic. It is recommended that approval be granted for the use of Pyrethrins Fogging Concentrate to be used in conjunction with the hand-held ULV insecticide dispersal machine following manufacturer's labeling instructions. GRA

N78-31716# Franklin Inst. Research Labs., Philadelphia, Pa. Science Information Services Dept.
A LITERATURE REVIEW: PROBLEM DEFINITION STUDIES ON SELECTED TOXIC CHEMICALS. VOLUME 6: OCCUPATIONAL HEALTH AND SAFETY AND ENVIRONMENTAL ASPECTS OF UREA-FORMALDEHYDE RESINS Final Report, Mar. 1977 - Apr. 1978
Shu-hsi Hsiao and John E. Villaume Apr. 1978 65 p refs
(Contract DAMD17-77-C-7020; DA Proj. 3E7-62720-A-835)
(AD-A054991) Avail: NTIS HC A04/MF A01 CSCL 06/1

The Problem Definition Study provides a literature review (88 references) on occupational health hazards and environmental impacts on urea-formaldehyde resins. This study covers the physical and chemical properties, toxicity in humans and animals, effects on microorganisms, plants, and soil organisms, pharmacokinetics, fate in the environment, industrial safety standards and practices and sampling and analysis of urea-formaldehyde resins. Environmental impacts are discussed and recommendations for further studies are provided. Urea-formaldehyde resins are mixtures of condensation products of urea and formaldehyde with indefinite composition, and structure depending on the degree of polymerization. The highly polymerized resins are inert solids which are very stable under ambient conditions and are not readily degraded in the environment. The low molecular weight condensation products are viscous liquids or powdery solids which decompose easily, releasing free formaldehyde that is highly irritating to eyes, skin and mucous membranes of humans and animals. They can be used as antibacterial products. GRA

N78-31717# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
CONTRAST SENSITIVITY OF THE HUMAN VISUAL SYSTEM AT ONE LUMINANCE LEVEL WHILE ADAPTED TO A STIMULUS AT ANOTHER LUMINANCE LEVEL M.S. Thesis
Carl P. Scheidegg Dec. 1977 191 p refs
(AD-A055238; AFIT/GE/EE/77D-34) Avail: NTIS HC A09/MF A01 CSCL 06/16

This report documents an investigation of the hypothesis that receptive field organization in the human visual system changes due to a change in stimulus average luminance. Adaptation and testing at the same average luminance produced a depression in the contrast sensitivity curve centered over the adapting spatial frequency. A difference in average luminance between the adapting pattern and the test pattern was expected to produce a spatial frequency shift in the depression of the adaptation curve. Some shift in the adaptation depression was observed indicating that some kind of change in the visual system had occurred, however, the results did not provide sufficient evidence to conclude that a receptive field size change had taken place as a result of the luminance change. GRA

N78-31718# Oregon Univ. Health Sciences Center, Portland. Biophysics Lab.
ELECTRICAL ENHANCEMENT OF HEALING IN COMBAT INJURIES TO HARD AND SOFT TISSUES Annual Summary Report
B. S. Savara, R. W. Fields, R. B. Tacke, and M. H. Bartley 20 May 1978 43 p refs
(Contract DADA17-72-C-2185; DA Proj. 3S7-62775-A-825)
(AD-A055531) Avail: NTIS HC A03/MF A01 CSCL 06/5

Over the past decade a large body of experimental evidence has accumulated showing the positive influence of electric currents on bone metabolism. It is evident that modeling, remodeling and repair are regulated, through bone's piezoelectric properties as mechanical transducers in a closed loop system. In situations where enhancement of normal function of the transducer system is desirable, viz during bone repair, it would be advantageous to use an exogenous source of electric current. Author (GRA)

N78-31719# Technology, Inc., San Antonio, Tex. Life Sciences Div.
AN EXPERIMENTAL INVESTIGATION OF THE EFFECT OF 1.06 MICROMETERS LASER LIGHT ON THE TRANSPARENT OCULAR MEDIA Final Report, 1975 - 1977

Norma D. Miller Jun. 1977 16 p refs
(Contract DAMD17-75-C-5040; DA Proj. 3A7-62758-A-824; DA Proj. 3E7-62772-A-813)
(AD-A055650) Avail: NTIS HC A02/MF A01 CSCL 06/16

A unique camera attachment for a Zeiss Slit Lamp is described. The purpose of the camera is to provide a means of quantifying changes in the scattering properties of the lens. The film plane is tilted at an angle to the axis of the biomicroscope to permit sharp imagery of the entire illuminated cross section of the cornea and lens. A photographic step wedge is included in the film plane and is illuminated by a sample of the slit beam after passing through the microscope and camera optics. Typical photographs are presented. Author (GRA)

N78-31720# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

DESCRIPTION AND ANALYSIS OF THE HEWLETT-PACKARD 78220 ARRHYTHMIA MONITORING SYSTEM M.S. Thesis

Samuel L. Harris Mar. 1978 61 p refs
(AD-A055451; AFIT/GE/EE/78-2) Avail: NTIS HC A04/MF A01 CSCL 06/2

The Hewlett-Packard (HP) 78220 Arrhythmia Monitoring System is ventricular-oriented and detects the most significant ventricular contractions (PVCs) of Lead II electrocardiograms (ECGs). The HP monitoring software consists of a number of relocatable program modules. The program modules are divided into three main categories. The first is called system initialization, the second is real time processing, and the third is background processing. The real time portion includes the AZTEC transformation which is applied to the input waveform and records only the changes in the waveform that succeed some predetermined threshold to achieve a tremendous data reduction. GRA

N78-31721# California Univ., Livermore. Lawrence Livermore Lab.

DESIGN AND CONSTRUCTION OF THE DONNER 280-CRYSTAL POSITRON RING FOR DYNAMIC TRANSVERSE SECTION EMISSION IMAGING

Stephen E. Derenzo, Paul G. Banchero, John L. Cahoon, Ronald H. Huesman, Tony Vuletich, and Thomas F. Budinger Sep. 1977 11 p refs Presented at IEEE Conf. on Decision and Control, New Orleans, 7 Dec. 1977
(Contract W-7405-eng-48)
(LBL-5679; Conf-771205-1) Avail: NTIS HC A02/MF A01

The design and construction of a medical imaging system for the rapid, accurate, three-dimensional imaging of positron-labeled compounds in the human body are described. The medical research goals included quantifying blood flow and metabolism in human heart muscle and brain. The system consisted of a large gantry containing lead shielding and a ring of 280 NaI(Tl) detectors that completely encircled the patient; 280 photomultiplier tubes, preamplifiers and timing discriminators; circuits that determined whenever a crystal has detected a gamma ray in time coincidence (i.e., within 12 nsec) of any of the opposing 105 crystal and determined the addresses of the crystal involved; 120K words of 12 bit memory for the simultaneous acquisition of data from eight portions of the cardiac cycle; and a hardwired image reconstructor capable of filtering and back-projecting data from 140 views to form a 210 x 210 computed transverse section image in less than 2 sec. ERA

N78-31722# Oak Ridge National Lab., Tenn.

ORIS: THE OAK RIDGE IMAGING SYSTEM PROGRAM LISTINGS

P. R. Bell and J. M. Dougherty Apr. 1978 417 p
(Contract W-7405-eng-26)
(ORNL-TM-5875-V3) Avail: NTIS HC A18/MF A01

The imaging system is a general purpose access, storage, processing and display system for nuclear medicine imaging with rectilinear scanner and gamma camera. Listings of the PDP-8/E version of ORIS version '2 are discussed. The system is designed to run under the OS/8 monitor in 16 K or more words of core. System and image file mass storage is on RK8E disk; longer-time image file storage is provided on DECtape. Another version of this program exists for use with the RF08 disk, and a more limited version is for DECtape only. ERA

N78-31723# Greenfield, Attaway and Tyler, Inc., San Rafael, Calif.

NITROGEN OXIDES: CURRENT STATUS OF KNOWLEDGE Final Report

Anthony V. Colucci and William S. Simmons Feb 1978 198 p refs
(EPRI Proj. TR-11900-5)
(EPRI-EA-668) Avail: NTIS HC A09/MF A01

The current state of knowledge regarding dioxide, nitrites, nitrates, peroxacyl nitrates, and N-nitrosoamines is reviewed. A critical review is provided of existing toxicological, human clinical and epidemiological assessment methodologies and data. Special consideration is given to the identification and explanation of the controversial issues surrounding health effects which have been related to ambient levels of NO2/NO. Evaluation of existing information on the effects of suspended nitrates and airborne nitrosoamines is emphasized. Suggestions are offered for future research programs involving the health effects of nitrogen oxides. ERA

N78-31724# Los Alamos Scientific Lab., N. Mex.

LATE BIOLOGICAL EFFECTS OF IONIZING RADIATION AS INFLUENCED BY DOSE, DOSE RATE, AGE AT EXPOSURE, AND GENETIC SENSITIVITY TO NEOPLASTIC TRANSFORMATION

J. F. Spalding, J. R. Prine, and G. L. Tietjen 1978 11 p Presented at Symp. on Late Biol. Effects of Ionizing Radiation, Vienna, 13-17 Mar. 1978; sponsored by IAEA
(Contract W-7405-eng-36)
(LA-UR-78-681; Conf-780306-4; IAEA-SM-224/201) Avail: NTIS HC A02/MF A01

The late biological effects of whole-body exposure to gamma irradiation as they may be influenced by total dose, dose rate, age at exposure, and genetic background were studied. Strain C57B1/6J mice of four age groups (newborn, 2, 6, and 15 months) were given five doses (20, 60, 180, 540, and 1620 rad) of gamma rays, with each dose being delivered at six dose rates (0.7, 2.1, 6.3, 18.9, 56.7 rad/day and 25 rad/min). Groups of forty to sixty mice were used in each of the approximately 110 dose/dose-rate and age combinations. The study was done in two replications with an equal number of mice per replication. Strain RF/J mice were used in a companion study to investigate the influence of genetic background on the type and magnitude of effect. Results of the first and second replications of the 15-month-old age group and data on the influence of genetic background on biological response show no significant life shortening within the dose and dose-rate range used. ERA

N78-31725# Brookhaven National Lab., Upton, N. Y. Biomedical and Environmental Assessment Div.

HAZARDS OF ORGANIC WORKING FLUIDS

Samuel Silberstein Aug. 1977 21 p refs
(Contract EY-76-C-02-0016)
(BNL-50761) Avail: NTIS HC A02/MF A01

Several brief reviews on working fluids proposed for use in organic Rankine and bi-phase bottoming cycles are presented. There are several general problems with many organic working fluids; flammability, toxicity, and a tendency to leak through seals. Two of the proposed working fluids will be used at temperatures above the manufacturer's maximum recommended temperature, and one will be used in a way different from its customary usage. In some cases, it may be more profitable to first seek alternative working fluids before committing large amounts of time and money to research projects on unsafe working fluids. ERA

N78-31726# Research Inst. of National Defence, Stockholm (Sweden).

CORRELATIONS BETWEEN NIGHT VISION TESTS

Hans Marmolin Dec. 1977 27 p refs Sponsored in part by Delegation for Appl. Med. Defence Res., Found. Fylgias 80-AArs Fond, and Mil. Med. Exam. Centre
(FOA-C-56014-H9) Avail: NTIS HC A03/MF A01

An investigation of interindividual correlations between five night vision tests used in eye clinics is reported. Correlations were computed between the twenty measures of night vision ability obtained from the five tests and a principal component

analysis was performed of the correlation matrixes. Six independent factors were obtained: a contrast sensitivity factor; a light sensitivity factor; two glare sensitivity factors, one related to recovery from a point glare source, one related to recovery from a diffuse glare source; and two adaptation factors, one mesopic and one scotopic. Author (ESA)

N78-31727# Auerbach Associates, Inc., Philadelphia, Pa.
NITROSAMINES Final Report
Jerome T. Maddock, Wendy L. Byer, Roger T. Malseed, John Keresztesy, and Arthur Katz 17 Dec. 1977 92 p refs
(Contract CPSC-C-76-0067)
(PB-280479/7; AAI-2383/2384-800-TR-2) Avail: NTIS HC A05/MF A01 CSCL 06T

The known existence of nitrosamines in consumer products and to what extent they present a hazard to people was reviewed. Evidence of acute and chronic toxicity, carcinogenicity, mutagenicity and teratogenicity was shown for many animal species but not directly for man. GRA

N78-31728# Auerbach Associates, Inc., Philadelphia, Pa.
STRONG SENSITIZERS Final Monograph
Jerome T. Maddock, Marcus Sittenfield, and Diane Neff 18 Nov. 1977 203 p refs
(Contract CPSC-C-76-0067)
(PB-280475/5; AAI-2383/2384-300-TR-2) Avail: NTIS HC A10/MF A01 CSCL 06T

Data for the evaluation of potential additions to, and/or modifications of the Federal Hazardous Substances Act Regulations are presented. Strong sensitizers are redefined in terms of severity of the reaction. The practicality and predictive value of patch testing is discussed as is the evolving state of current epidemiological data. It was proposed that a criteria be developed to clearly designate substances as strong sensitizers based upon: (1) frequency of sensitization in normal individuals; (2) frequency in exzema patients; (3) frequency in animal models; (4) frequency in occupationally exposed populations, and/or nature of the reaction, overt vs. covert, transient vs. chronic, and explosive vs. smoldering. GRA

N78-31729# General Electric Co., Schenectady, N. Y. Corporate Research and Development.
DEVELOPMENT AND EVALUATION OF AN ULTRASONIC IMAGING SYSTEM Final Report, 15 Mar. 1976 - 13 Oct. 1977
Henry A. F. Rocha 14 Oct. 1977 70 p
(Contract N01-HV-5-2966)
(PB-279834/6; SRD-77-185) Avail: NTIS HC A04/MF A01 CSCL 06L

An infrared laser transmitting transducer capable of generating fast acoustic pulses and of an electrostatic receiving transducer with a correspondingly broad bandwidth were developed for acoustic visualization of atheroma in the coronary arteries. The transmitting transducer was operated successfully. One form of the receiving transducer was found to operate with acceptable sensitivity and bandwidth; however, operation of different units was nonreproducible on a regular basis. GRA

N78-31730# Health Effects Research Lab., Research Triangle Park, N. C. Criteria and Special Studies Office.
AIR QUALITY CRITERIA FOR LEAD
Dec. 1977 299 p refs
(PB-280411/0; EPA-600/8-77-017) Avail: NTIS HC A13/MF A01 CSCL 06T

The relationships between airborne lead and consequent effects on man and his environment are considered. Although this document deals mainly with airborne lead, it also outlines other environmental routes of exposure to lead and gives approximations of the relative contributions to human exposure of the respective routes. In man, lead primarily affects red blood cells, the central and peripheral nervous systems, soft tissues, such as liver and kidney, and bone; the latter ultimately sequesters 95% of the body's lead burden. Significant biological indices of exposure to lead include microgram quantities of lead and of erythrocyte protoporphyrin (EP) per deciliter of blood (micrograms/d). Adverse effects range from elevated EP and mild anemia at 20 to 40 micrograms/di--through gastrointestinal, renal, and hepatic pahtologies--to severe neurobehavioral impairment. GRA

N78-31731# Harvard School of Public Health, Boston, Mass. Dept. of Physiology.
PHYSIOLOGICAL RESPONSE TO ATMOSPHERIC POLLUTANTS
Mary O. Amdur Mar. 1978 44 p refs
(Grant EPA-R-802030)
(PB-280413/6; EPA-600/1-78-021) Avail: NTIS HC A03/MF A01 CSCL 06T

Several materials were examined as air pollutants of interest for their irritant effects. These included sulfuric acid, a series of inorganic sulfates, and a combination of ozone and sulfur dioxide. Some attention was also given to the effect of various oil mists on the irritant response to sulfur dioxide. By relating intrapleural pressure change to change in flow rate points of equal lung volume, it was possible to calculate the flow resistance; by relating pressure change to volume at the beginning and end of inspiration, it was possible to calculate compliance. These studies indicate that the irritant response previously observed at higher concentrations of sulfuric acid is also observed at concentrations below 1 mg cu m. GRA

N78-31732# National Technical Information Service, Springfield, Va.
COLD WEATHER STRESS ON HUMANS. A BIBLIOGRAPHY WITH ABSTRACTS Final Report, 1964 - May 1978
Elizabeth A. Harrison Jun. 1978 138 p Supersedes NTIS/PS-77-0456;NTIS/PS-76-0347; NTIS/PS-75/170
(NTIS/PS-78/0540/1; NTIS/PS-77/0456; NTIS/PS-76/0347; NTIS/PS-75/170) Avail: NTIS HC $28.00/MF $28.00 CSCL 06S

The selected abstracts cover cold stress, cold tolerance, cold injuries, acclimatization, protective clothing, and cold water exposure as related to cold weather stress on humans. (This updated bibliography contains 132 abstracts, 21 of which are new entries to the previous edition.) GRA

N78-31733# Informatics, Inc., Rockville, Md.
FEDERAL NOISE RESEARCH IN NOISE EFFECTS Final Report
14 Feb. 1978 164 p
(Contract EPA-68-01-0788)
(PB-280335/1; EPA-550/9-78-102) Avail: NTIS HC A08/MF A01 CSCL 06S

The program was documented and reviewed. The program expanded slightly over the last few years, with more agencies participating. The program is reasonably comprehensive and in general coordinated with no unjustified overlap of efforts. Research needs to support and justify regulatory and standards requirements were identified by the Panel as being of the highest priority. Satisfaction of these relatively short term goals with present budget restrictions could jeopardize long-range basic research needs to understand basic effects mechanisms. To satisfy both requirements, the Panel on the average recommends an increase of the overall Federal noise effects research budget of 40%. The panel recommends several specific research topics for high priority funding. Among the areas requiring additional support are effects of noise on sleep, and community or collective response. GRA

N78-31734# Seville Research Corp., Pensacola, Fla.
US NAVY FLEET AVIATION TRAINING PROGRAM DEVELOPMENT Final Report, Oct. 1976 - Oct. 1977
Wallace M. Prophet Mar. 1978 90 p refs Prepared in Cooperation with Human Resources Research Organization, Alexandria, Va.
(Contract N61339-77-C-0009)
(AD-A055788; HUMRRO-FR-ED-77-25) Avail: NTIS HC A05/MF A01 CSCL 05/9

Four specific aircraft training program development efforts (A-6E, E-2C, EA-6B, and SH-2F) were examined and compared as to methodology and procedures used. The four efforts embodied principles of the Systems Approach to Training (SAT) and/or Instructional Systems Development (ISD). Three different

contractors were involved, and the programs were under the technical direction of the Naval Training Equipment Center. The four projects carried through the point in the SAT/ISD process of development of lesson specification documents. In addition to examining procedural and methodological differences of the four programs, the report describes the various program products and examines their utility for subsequent steps in the SAT/ISD process. The report also examines the general model that has been evolving in a variety of NAVTRAEQUIPCEN sponsored efforts for the conduct of SAT/ISD programs. The model and its associated documentation are examined in terms of their utility for aviation training program developmental efforts. The report concludes that these various activities have advanced the Navy's capabilities significantly for the development of more effective aviation training program efforts in the future. Several areas are suggested for further improvement of the model. These include: (1) making it more applicable to complex in-cockpit psycho-motor skills (as contrasted with cognitive skills); (2) techniques of flight performance measurement, and (3) means of enhancing the role of simulator training in the model. GRA

N78-31735* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SPACESUIT MOBILITY JOINTS Patent
Hubert C. Vykukal, inventor (to NASA) Issued 30 May 1978 22 p Filed 23 Dec. 1976 Supersedes N77-15641 (15 - 06 p 0789)
(NASA-Case-ARC-11058-1; US-Patent-4,091,464; US-Patent-Appl-SN-753965; US-Patent-Class-2-2.1A; US-Patent-Class-285-235) Avail: US Patent Office CSCL 05H

Joints for use in interconnecting adjacent segments of an hermetically sealed spacesuit which have low torques, low leakage and a high degree of reliability are described. Each of the joints is a special purpose joint characterized by substantially constant volume and low torque characteristics. Linkages which restrain the joint from longitudinal distension and a flexible, substantially impermeable diaphragm of tubular configuration spanning the distance between pivotally supported annuli are featured. The diaphragms of selected joints include rolling convolutions for balancing the joints, while various joints include wedge-shaped sections which enhance the range of motion for the joints.
Official Gazette of the U.S. Patent Office

N78-31736* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SPACESUIT TORSO CLOSURE Patent
Bruce W. Webbon and Hubert C. Vykukal, inventors (to NASA) Issued 30 May 1978 8 p Filed 23 Mar. 1977 Supersedes N77-25784 (15 - 16, p 2170)
(NASA-Case-ARC-11100-1; US-Patent-4,091,465; US-Patent-Appl-SN-780569; US-Patent-Class-2-2.1A) Avail: US Patent Office CSCL 05H

A simple, economical and reliable entry closure is described for joining opposite halves of a torso section for a pressure suit in a manner which simplifies self-donning. A single coupling joins coaxially aligned, axially separable, tubular segments of a hard spacesuit along an angulated zone of separation, adapted to be mated in an hermetically sealing relation. A releasable C section clamp secures the members in their mated relationship.
Official Gazette of the U.S. Patent Office

N78-31737 Stanford Univ., Calif.
A COMPARISON OF CONTROL MODES FOR TIME DELAYED REMOTE MANIPULATION Ph.D. Thesis
Gregory Paul Starr 1978 220 p
Avail: Univ. Microfilms Order No. 78-14212

The hypothesis that a joystick-rate-control system, where removal of the operator's hand from the joystick insures zero velocity, will degrade less with time delay than a master-slave control system was tested. Master-slave control and rate-control were implemented on the NASA Ames remote manipulator. This manipulator's unusual geometry required the use of Resolved Motion Rate-Control which uses a digital computer to assist the operator. A peg-in-hole transfer task was used in the manipulation experiments, and data acquisition was done by digital computer, providing an extremely accurate record of performance. Manipulator hand position as well as completion times were recorded. Results indicate that the rate control system was more effective in those portions of the task requiring high accuracy. Master-slave control appears superior in portions of the task emphasizing speed.
Dissert. Abstr.

N78-31738# Royal Aircraft Establishment, Farnborough (England).
THE VIBRATING ENVIRONMENT IN TRANSPORT VEHICLES: A CRITICAL BIBLIOGRAPHICAL STUDY
G. Bonnardel, B. Favre, and J. L. Flores Mar. 1978 152 p refs Transl. into ENGLISH of "Environement Vibratoire dans les Véhicules de Transport., Etude Bibliographique Critique", Rept. IRT-12 Inst. de Rech. des Transports, France, Dec. 1975 152 p.
(RAE-Lib-Trans-1917; BR64081) Avail: NTIS HC A08/MF A01

A physical description of the vibratory and dynamic environment of a road vehicle is given in order to understand the vibratory stimuli to which a passenger is subjected. Special attention was paid to the vehicle suspension and to the seats. The passenger was considered as a mechanical model for exploring human body behavior under the effect of vibratory stimuli. The physiological reactions of a person subjected to such a loading were used to establish criteria of human tolerance to vibrations. In particular, the case of the ISO standard TC-108 is examined. Emphasis is placed on human tolerance to acceleration and jerk.
G.G.

N78-31739*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A PILOT EVALUATION OF TWO G-SEAT CUEING SCHEMES
Thomas W. Showalter Aug. 1978 34 p refs
(NASA-TP-1255; A-7390) Avail: NTIS HC A03/MF A01 CSCL 05H

A comparison was made of two contrasting G-seat cueing schemes. The G-seat, an aircraft simulation subsystem, creates aircraft acceleration cues via seat contour changes. Of the two cueing schemes tested, one was designed to create skin pressure cues and the other was designed to create body position cues. Each cueing scheme was tested and evaluated subjectively by five pilots regarding its ability to cue the appropriate accelerations in each of four simple maneuvers: a pullout, a pushover, an S-turn maneuver, and a thrusting maneuver. A divergence of pilot opinion occurred, revealing that the perception and acceptance of G-seat stimuli is a highly individualistic phenomena. The creation of one acceptable G-seat cueing scheme was, therefore, deemed to be quite difficult.
L.S.

N78-31740*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DISPOSAL OF RADIOACTIVE IODINE IN SPACE
Rowland E. Burns and J. Gregory Defield Aug. 1978 40 p refs
(NASA-TP-1313; M-260) Avail: NTIS HC A03/MF A01 CSCL 06T

The possibility of space disposal of iodine waste from nuclear power reactors is investigated. The space transportation system utilized relies upon the space shuttle, a liquid hydrogen/liquid oxygen orbit transfer vehicle, and a solid propellant final stage. The iodine is assumed to be in the form of either an iodide or an iodate, and calculations assume that the final destination is either solar orbit or solar system escape. It is concluded that space disposal of iodine is feasible.
Author

N78-31741# Naval Weapons Center, China Lake, Calif.
DISPLAY SIZE AND TARGET ACQUISITION PERFORMANCE Report, Jul. 1976 - Oct. 1977
Michael J. Barnes Jan. 1978 47 p refs
(WF55525000)
(AD-A054624; NWC-TP-6006) Avail: NTIS HC A03/MF A01 CSCL 05/8

Two experiments were conducted to find factors that have an important effect on display size criteria in a cockpit-display system. Subjects in both experiments detected military targets

simulating images from a TV camera looking obliquely forward as it is flown over the terrain. The results of the two experiments indicated that the physical size of a television monitor is not an important factor if MTF and visual angle are held constant. Of the factors studied, the four most important were: number of targets, visual angle of targets, target contrast, and target configuration. The data from the second experiment were used to generate a multiple regression model. The relationship between target visual angle and display size allowed the regression model to be used to predict performance as a function of display size.
Author (GRA)

N78-31742# Army Aeromedical Research Lab., Fort Rucker, Ala.
VISUAL WORKLOAD OF THE COPILOT/NAVIGATOR DURING TERRAIN FLIGHT Final Report
Michael G. Sanders, Ronald R. Simmons, and Mark A. Hofmann Dec. 1977 33 p refs
(AD-A055038; USAARL-78-5) Avail: NTIS HC A03/MF A01 CSCL 05/9

The emphasis on aviator workload has been of primary concern to the U.S. Army aviation community since the incorporation of low altitude terrain flight techniques into the helicopter tactics repertory. Since navigation is a particularly acute problem at low altitudes, this project examined the visual workload of the navigator/copilot during terrain flight (nap-of-the-earth, contour and low level) in a UH-1H helicopter. The navigator's task was to: (1) perform a map study of the prescribed course, (2) direct the pilot during the flight as to the direction of flight, altitude and airspeed desired to traverse the course, and (3) identify hover points and checkpoints along the route which were given to the navigator in terms of six digit grid coordinates. Visual performance was measured via a modified NAC Eye Mark Recorder used in conjunction with a LOCAM high speed camera. This technique provided the means to objectively record and analyze the navigator's visual performance through the examination of: (1) visual time inside the cockpit on flight and engine instruments, (2) time inside the cockpit on the map or other navigation aids, and (3) time outside the cockpit in various windscreen sectors.
GRA

N78-31743# Texas Univ. at Arlington. Dept. of Mechanical Engineering.
AN EVALUATION OF THE FLUIDIC OXYGEN PARTIAL PRESSURE SENSOR Final Report, Jan. - Jul. 1976
Robert L. Woods Dec. 1977 76 p refs
(Contract F41609-76-C-0028)
(AD-A055362; FLCS-7601; SAM-TR-77-31) Avail: NTIS HC A05/MF A01 CSCL 06/11

A theoretical concept for a fluidic gas partial pressure sensor is evaluated. In the sensor concept, a fluidic resistive bridge gas concentration sensor is powered by the vacuum produced with a compressible flow ejector. Because of the ejector characteristics, the pressure drop across the bridge is proportional to the ambient pressure; hence, the sensor output is proportional to the gas concentration and the ambient pressure, the product of which is partial pressure. A complete mathematical model is derived that is in close agreement with the experiment. A prototype sensor is discussed and tested over a range of 0.3 to 1.0 atmospheres pressure and 0 to 100% concentrations of CO2 in air and O2 in air. The test results show that the sensor responds to both variables. Environmental sensitivities and signal amplification are discussed.
Author (GRA)

N78-31744# Mitre Corp., McLean, Va. METREX Div.
VIBRATION ASPECTS OF RIDE QUALITY MODELING FOR THE DOT PTACV: THEORY AND EXPERIMENT
Roger Katz Dec. 1977 59 p refs
(Contract DOT-FR-54090)
(PB-279846/0; MTR-7692; FRA/ORD-78/02) Avail: NTIS HC A04/MF A01 CSCL 13F

Analytical models to predict the acceleration levels at frequencies which affect passenger ride confort have been developed. The suitability of analytical models used to predict the heave acceleration in the passenger cabin of The Department of Transportation's Prototype Tracked Air Cushion Vehicle (PTACV) is discussed. A comparison of theoretical predictions from an analytical model, typical of those in common usage, with measured response accumulated during testing of the PTACV on its test track is presented.
GRA

N78-31745# Advisory Group for Aerospace Research and Development, Paris (France).
METHODS TO ASSESS WORK LOAD
Jun. 1978 136 p refs Presented at the Aerospace Med. Panel Specialists Meeting, Cologne, 18-22 Apr. 1977
(AGARD-CP-216; ISBN-92-835-1285-5) Avail: NTIS HC A07/MF A01

Physiological and mathematical methods are examined for determining pilot and air traffic controller workloads.

N78-31746# Naval Aerospace Medical Research Lab., Pensacola, Fla.
IS MAN THE WEAKEST LINK?
Harvey G. Gregoire *In* AGARD Methods to Assess Workloads Jun. 1978 3 p
Avail: NTIS HC A07/MF A01

A portable video tape recorder and camera were installed on the aft bulkhead of the crew compartment to obtain inflight video records of aircrew activity during test flights of a new antisubmarine (ASW) aircraft. The technique proved successful in providing graphic records of real time crew utilization of systems controls and displays. In combination with crew briefing and debriefing interviews, the annotated tapes provided a basis for activity sampling, scoring task times and error rates, evaluating display utilization, counting control inputs and display mode changes, and for other observations pertinent to crew task loading. Data was obtained during passive acoustic submarine search and track operation during actual ASW test flights. This data indicated that during passive acoustic search and tracking, individual control tasks requiring one or more pushbutton operations were performed from 6 to 10 times per minute. Display mode changes occurred at intervals of approximately two minutes. The operators in this limited sample made integrated control system inputs exclusively with the right hand.
G.G.

N78-31747# Army Aeromedical Research Lab., Fort Rucker, Ala. Aviation Psychology Div.
METHODOLOGICAL CONSIDERATIONS OF VISUAL WORKLOADS OF HELICOPTER PILOTS
Ronald R. Simmons and Kent A. Kimball *In* AGARD Methods to Assess Workloads Jun. 1978 9 p refs

Avail: NTIS HC A07/MF A01

The techniques and modifications for assessing visual performance/workload of pilots during helicopter operations are reviewed. Although the corneal reflection technique for gathering eye movement data is not new, innovative modifications had to be developed to permit accurate data collection in this flight environment.
G.G.

N78-31748# Human Engineering Labs., Aberdeen Proving Ground, Md.
USE OF EYE-MOVEMENT MEASURES TO ESTABLISH DESIGN PARAMETERS FOR HELICOPTER INSTRUMENT PANELS
John A. Barnes *In* AGARD Methods to Assess Workloads Jun. 1978 9 p refs

Avail: NTIS HC A07/MF A01

The pilot's eye-scan path and fixation point recordings during actual helicopter flight provided an accurate measure of the visual workload imposed by a particular panel design. Initial work was done in the UH-1 helicopter using experienced instrument-rated pilots flying actual maneuvers on instruments. The knowledge gained from these data was used to design a helicopter instrument panel in which the most referred to instruments were placed so that the eye-scan paths were minimized. This design considerably lessens the pilot's visual workload, cuts fatigue and allows him more time for other tasks.
G.G.

N78-31749# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
AUDITORY COMMUNICATION AND WORKLOAD
Roger Green and Ray Flux *In* AGARD Methods to Assess Workloads Jun. 1978 8 p refs

Avail: NTIS HC A07/MF A01

Psychomotor workload interference with the performance of an auditory communications task was studied. Two experiments are described: The first illustrates that an auditory task from which a cumulative response time measure is taken is effected by changes in signal quality, and the second experiment shows that the same auditory task is also affected by a realistic form of workload (flying an aircraft simulator). The implications of those findings are discussed both in terms of assessing the quality required of a communications system and in terms of the use of secondary tasks in the assessment of workload. G.G

N78-31750# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
PITCH AND FORMANT ANALYSIS OF THE VOICE IN THE INVESTIGATION OF PILOT WORKSHOP
R. Cannings, R. G. Borland, L. E. Hill, and A. N. Nicholson *In* AGARD Methods to Assess Workloads Jun. 1978 11 p refs

Avail: NTIS HC A07/MF A01

Typical log spectral, cepstral and smoothed spectral estimates, obtained from in-flight recordings, are reported. The pitch peak in the cepstrum corresponded to a constant frequency of 94 Hz. The first formant peak was clearly visible and the peak picking algorithm showed it to be increasing from 520 to 575 Hz through the time course of the phonem. In this particular example the second formant peak is well defined (1400 Hz) and the third and fourth formants may also be seen at 2250 Hz and 3100 Hz, respectively. Preliminary examination of in-flight recordings indicates that this technique is useful for classifying specific phonems and is effective despite the noise corruption of the raw data. The nature of cockpit communications determines the choice of phonems. G.G.

N78-31751# Technische Hochschule, Darmstadt (West Germany).
DETERMINATION OF STRESS AND STRAIN OF AIR TRAFFIC CONTROL OFFICERS
Walter Rohmert *In* AGARD Methods to Assess Workloads Jun. 1978 8 p refs

Avail: NTIS HC A07/MF A01

Air traffic controlling means a work system with manual performance. All three partial functions, efficiency/controlling/monitoring, necessary to be fulfilled in each work system are operated by man himself. Based on the concept of the man-at-work-system and the description of strain-related work contents, a new ergonomic job description questionaire was developed. The results allow a deeper inlook into methods and techniques needed for evaluation purposes as well as for designing future air traffic control systems. G.G.

N78-31752# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
INSTRUMENTS AND METHODOLOGY FOR THE ASSESSMENT OF PHYSIOLOGICAL COST OF PERFORMANCE OF STRESSFUL CONTINUOUS OPERATIONS: THE AIR TRAFFIC SERVICES TOWER ENVIRONMENT
Jacques Soutendam *In* AGARD Methods to Assess Workloads Jun. 1978 32 p refs

Avail: NTIS HC A07/MF A01

A total of 39 females and males were used as subjects in a study designed to test the general validity and utility of methods and instruments of potential use in the determination of the physiological cost of work performance in stressful environments. A second goal of the study was to attempt a preliminary test of the hypothesis that a form of employment (air traffic service) traditionally considered stressful, was significantly different from general forms of employment traditionally considered less stressful. A consistent statistical significance was established when the entire sample was recategorized on the basis of subjective sleep adequacy assessment rather than by job description. G.G.

N78-31753# Technische Universitaet, Munich (West Germany). Inst. fuer Arbeitsphysiologie.
PHYSIOLOGICAL MEASURES OF WORKLOADS: CORRELATIONS BETWEEN PHYSIOLOGICAL PARAMETERS AND OPERATIONAL PERFORMANCE
Helmut Strasser *In* AGARD Methods to Assess Workloads Jun. 1978 8 p refs

Avail: NTIS HC A07/MF A01

The influence of different hypoxic gas mixtures on pursuit tracking and on some physiological parameters was studied. The following conclusions are made: Already, in relatively mild hypoxia, physiological changes are present, but normally were concealed by reactions due to prolonged test time. In spite of statistically significant physiological effects, no noticeable deterioration of performance in tracking was measured in hypoxia down to a hypoxic gas mixture of only 13% 02 in inspired air. Not until before 11% 02 significant and mentionable impairments of tracking performance were found. The same, shown for hypoxia, is true of noise. Decreased performance in noise was not found, but an increased level of heart rate indicated the stress. Physiological indicators definitely react already in a low workload in order to bring in action reserves of energy. Operational measures alone fail to indicate the strain of the human operator. Only in high workload, correlations performance and physiological measures are expected. G.G.

N78-31754# Army Aeromedical Research Lab., Fort Rucker, Ala.
USE OF INSPIRATORY MINUTE VOLUMES IN EVALUATION OF ROTARY AND FIXED WING PILOT WORKLOAD
Frank S. Pettyjohn, Roderick J. McNeil, Lloyd A. Akers, and James M. Faber *In* AGARD Methods to Assess Workloads Jun. 1978 3 p refs

Avail: NTIS HC A07/MF A01

Inspiratory minute volume (IMV) measurements were utilized in the evaluation of US Army aircrew workload and stress in helicopter and fixed wing aircraft. The IMV data demonstrated a significant stress and/or workload level of the aviator in performance of helicopter day nap-of-the-earth NOE), night nap-of-the-earth flight (NNOE) and with the use of night vision devices (NVD). IMV 20.05 to 38.11 liters per minute NTPD were obtained during the performance of these combat operational techniques. IMV determination in-flight is considered a valuable clinical tool in the assessment of aircrew stress and/or workload. G.G.

N78-31755# Johann-Wolfgang-Goethe-Universitat, Frankfurt am Main (West Germany).
NEUROPHYSIOLOGICAL ASSESSMENT OF FUNCTIONAL STATES OF THE BRAIN
Kurt Offenloch *In* AGARD Methods to Assess Workloads Jun. 1978 4 p refs
Avail: NTIS HC A07/MF A01

Neurophysiological methods are used to assess functional states of the brain with precision that surpasses that of classical psychological methods. Not only neurological syndromes, but also slight changes on the vigilance scale as well as functional changes associated with cognitive and intellectual functions can be correlated with the electrical activity of the brain and hereby be objectively determined. G.G.

N78 31756# Naval Air Development Center, Warminster, Pa.
THE HUMAN OPERATOR SIMULATOR: WORKLOAD ESTIMATION USING A SIMULATED SECONDARY TASK
Norman E. Lane, Melvin I. Strieb (Analytics, Inc., Willow Grove, Pa.), and Robert J. Wherry, Jr. (Analytics, Inc., Willow Grove, Pa.) *In* AGARD Methods to Assess Workloads Jun. 1978 12 p refs
Avail: NTIS HC A07/MF A01

N78-31757

The use of the human operator simulator (HOS) for identifying potential workload problems is described. HOS is applicable during the midrange of system development, between early analytical prediction methods and later simulator evaluations. The HOS creates a software simulation of a trained human operator, his system hardware/software, and required interforces. The results demonstrate the applicability of HOS for workload evaluation and explore HOS operator behavior under varying conditions of task demand. Problems of definition and methodology for current workload measures are discussed and alternatives identified using HOS to control task difficulty and task demand parameters. The implications of HOS application for cost and flexibility improvements are examined, and further developments of the model for workload evaluation are prepared. G.G.

N78-31757# Naval Air Development Center, Warminster, Pa. Dept. of Crew Systems.
OPERATOR WORKLOAD ASSESSMENT MODEL: AN EVALUATION OF A VF/VA-V/STOL SYSTEM
Paul M. Linton, Dieter W. Jahns (Boeing Co., Seattle, Wash.), and Paul R. Chatelier (NASC, Washington, D. C.) *In* AGARD Methods to Assess Workloads Jun. 1978 12 p refs

Avail: NTIS HC A07/MF A01

The term operator workload generally refers to a concept used in evaluating the extent to which a human operator is occupied with meeting system demands. By systematically describing the steps undertaken to estimate the workload in a conceptual fighter/attack V/STOL aircraft, meeting Navy mission requirements, it is shown that while a single crewmember can probably manage the V/STOL in its primary mission phases, additional and refined workload assessment evaluations are required to conclusively settle the issue for all aspects of deployment. G.G.

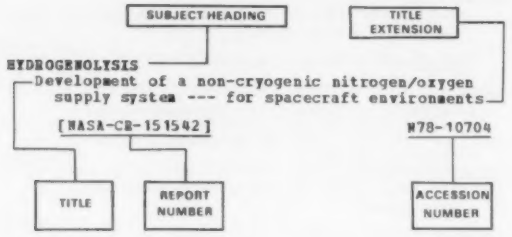
N78-31758# School of Aerospace Medicine, Brooks AFB, Tex.
MATHEMATICAL ANALYSIS AND COMPUTER SIMULATION IN MILITARY MISSION WORKLOAD ASSESSMENT
Richard A. Albanese *In* AGARD Methods to Assess Workloads Jun. 1978 7 p refs

Avail: NTIS HC A07/MF A01

Mathematical and computer approaches to the assessment of crew workload during military missions are discussed. Three analysis tools are reported: (1)estimation algorithms; (2) linear models; and (3) nonlinear/hybrid models. These separate but interacting methods provide increasing levels of detail with the focus on methods which attempt to determine whether a typical aircrew can accomplish the workload presented to it by an aircraft weapon system and mission requirements. G.G.

SUBJECT INDEX

Typical Subject Index Listing



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A

ABIOGENESIS
Chemical evolution and the origin of life
A78-47845
Genetic code correlations - Amino acids and their anticodon nucleotides
A78-47888

ABSORBENTS
Molecular sieve generation of aviator's oxygen: Breathing gas composition as a function of flow, inlet pressure, and cabin altitude
[AD-A054240] N78-30822

ACCELERATION
Subjective motion and acceleration induced by the movement of the observer's entire visual field
A78-48824

ACCELERATION STRESSES (PHYSIOLOGY)
Visual work capacity under the action of overloads and elevated temperature
A78-47972

ACCELERATION TOLERANCE
Realignments of the cardiovascular system of a human operator under the action of negative gravity
A78-48760

ACOUSTIC FATIGUE
Application of commercially available filter components for psychoacoustic testing
A78-49898

ACOUSTICAL HOLOGRAPHY
Development and evaluation of an ultrasonic imaging system
[PB-279834/6] N78-31729

ACOUSTICS
Diagnostic improvements in medical ultrasonic imaging systems
N78-31710

ACTIVATION (BIOLOGY)
Effect of gravity on lymphocyte activation
A78-48604

ADAPTATION
Adaptive cardiovascular changes to physical training in spontaneously hypertensive and normotensive rats
A78-46981
Man under conditions of weightlessness --- physiological effects
A78-47482
Adaptational fluctuations in the initial state of space flight --- astronaut performance
A78-47953
Medical problems of rationalizing the work-rest regimen of astronauts
A78-47956

ADAPTIVE CONTROL
Adaptive systems of spacecraft control
A78-47975

ADAPTIVE FILTERS
Biological model of a self-adjusting filter
A78-47965

ADENINES
Studies on adenine acid-soluble nucleotides content in the liver of gamma-irradiated chicken embryos
A78-48442

ADENOSINES
The effect of high altitude on pyridine nucleotides and adenosine phosphates in the liver of the rat
N78-31689

ADRENAL GLAND
Serotonin involvement in pituitary-adrenal function
A78-48575
Regulation of the adrenal cortex function during stress
[NASA-CR-157397] N78-30808

ADRENAL METABOLISM
Regulation of the adrenal cortex function during stress
[NASA-CR-157397] N78-30808

AEROSOLS
Toxicological evaluation of Pyrethrins Fogging Concentrate (trade name) study No. 51-1309-78
[AD-A055088] N78-31715

AEROSPACE ENVIRONMENTS
Method of animal training for biosatellite
A78-47110
Gravity as a biochemical determinant
A78-48671

AEROSPACE MEDICINE
Man under conditions of weightlessness --- physiological effects
A78-47482
Characteristics of cosmonaut activities during flight --- Russian book
A78-47951
Medical problems of rationalizing the work-rest regimen of astronauts
A78-47956
Psychological model of weightlessness in space flight simulation
A78-47958
Justification of the use of artificial gravity in space flight --- for optimal astronaut performance
A78-47959
Continuous metabolic and cardiovascular measurements on a monkey subject during a simulated 6-day Spacelab mission
A78-48719
Translations on USSR science and technology: Biomedical and behavioral sciences, no. 35
[JPRS-71467] N78-31694

AGE FACTOR
Age-related changes in glycolysis in the rat liver during high-altitude acclimatization
A78-49584

AGING (BIOLOGY)
Spectrophotofluorometric and electron microscopic study of Lipofuscin accumulation in the testis of aging mice
A78-48581

AIR POLLUTION
Biological significance of some metals as air pollutants. Part 2: Mercury
[PB-279670/4] N78-30814

Physiological response to atmospheric pollutants
[PB-280413/6] N78-31731
AIR QUALITY
Air quality criteria for lead
[PB-280411/0] N78-31730
AIR TRAFFIC CONTROLLERS (PERSONNEL)
Objective workload and behavioural response in airport radar control rooms
A78-47491
Use of the occupational knowledge test to assign extra credit in selection of air traffic controllers
[AD-A053675] N78-30818
Methods to assess work load
[AGARD-CP-216] N78-31745
Determination of stress and strain of air traffic control officers --- physiological response measurements
N78-31751
Instruments and methodology for the assessment of physiological cost of performance of stressful continuous operations: The air traffic services tower environment
N78-31752
Neurophysiological assessment of functional states of the brain --- electroencephalographic responses to workloads
N78-31755
AIRCRAFT ACCIDENT INVESTIGATION
Inquest after a civil aviation accident - Personal experience
A78-46956
AIRCRAFT ACCIDENTS
Spatial disorientation in general aviation accidents
A78-48081
AIRCRAFT EQUIPMENT
NGI advances --- valveless LOX converter for Tornado aircraft
A78-50085
Display size and target acquisition performance
[AD-A054624] N78-31741
AIRCRAFT INSTRUMENTS
A reaction time analysis of instrument scanning --- by aircraft pilots
A78-49275
Use of eye-movement measures to establish design parameters for helicopter instrument panels
N78-31748
AIRCRAFT LANDING
Comparison of the visual perception of a runway model in pilots and nonpilots during simulated night landing approaches
A78-48076
Simulator study for the determination of the demands upon the pilot in the case of unconventional, spatially curved approach profiles --- German thesis
A78-49406
AIRCRAFT PILOTS
Choice and analytic techniques involving indices of visual information input. I
A78-46954
Interrelation of psychosomatic troubles and psychoneurotic troubles in aeronautics
A78-46958
Crises of maladaptation in confirmed pilots
A78-46959
Longevity in military pilots - 37-year followup of the Navy's '1000 Aviators'
A78-48087
Altitude tolerance of general aviation pilots with normal or partially impaired spirometric function
A78-48088
ALL-WEATHER AIR NAVIGATION
Visual workload of the copilot/navigator during terrain flight
[AD-A055038] N78-31742
ALLERGIC DISEASES
Strong sensitizers
[PB-280475/5] N78-31728
ALTERNATING CURRENT
Possibility of attenuating the ecological effects of alternating current power lines as a result of new designs and circuit changes
N78-31708
ALTITUDE ACCLIMATIZATION
CSF pH and ventilatory acclimatization to altitude --- cerebrospinal fluid
A78-47208
Age-related changes in glycolysis in the rat liver during high-altitude acclimatization
A78-49584
ALTITUDE TOLERANCE
Hypoxia tolerance in rats in relation to tissue glycogen levels
A78-48078
Altitude tolerance of general aviation pilots with normal or partially impaired spirometric function
A78-48088
AMINO ACIDS
Genetic code correlations - Amino acids and their anticodon nucleotides
A78-47888
The genetic code as a periodic table
A78-47889
AMMONIA
Assessment of free-living nitrogen fixing microorganisms for commercial nitrogen fixation --- economic analysis of ammonia production
[NASA-CR-157565] N78-30798
ANALOG SIMULATION
Analog simulation of the movements of an ideal manipulator
A78-48511
ANTIDOTES
Behavior, ecology and toxicity of venomous marine fishes
[AD-A054925] N78-31692
APOLLO SOYUZ TEST PROJECT
Dosimetric and biological results from the Bacillus subtilis Biostack experiment within the ASTP
A78-48598
Genetic effects of cosmic radiation on bacteriophage T4Br/+/ - On materials of biological experiment 'Soyuz-Apollo'
A78-48682
Analytical study of electrophoretic characterization of kidney cells --- conducted during the Apollo Soyuz Test Project
[NASA-CR-150790] N78-31713
ARGON-OXYGEN ATMOSPHERES
Molecular sieve generation of aviator's oxygen: Breathing gas composition as a function of flow, inlet pressure, and cabin altitude
[AD-A054240] N78-30822
ARRHYTHMIA
Description and analysis of the Hewlett-Packard 78220 arrhythmia monitoring system
[AD-A055451] N78-31720
ARTIFICIAL GRAVITY
Justification of the use of artificial gravity in space flight --- for optimal astronaut performance
A78-47959
ARTIFICIAL INTELLIGENCE
Manipulators: Dynamics and algorithms --- Russian book
A78-48529
ASSESSMENTS
Methods to assess work load
[AGARD-CP-216] N78-31745
ASTRONAUT PERFORMANCE
Sensory deprivation as a problem of prolonged space flights
A78-47484
Characteristics of cosmonaut activities during flight --- Russian book
A78-47951
Adaptational fluctuations in the initial state of space flight --- astronaut performance
A78-47953
Pilot training and prognosis of psychophysiological conditioning of astronauts
A78-47955
Medical problems of rationalizing the work-rest regimen of astronauts
A78-47956
Psychological model of weightlessness in space flight simulation
A78-47958
Justification of the use of artificial gravity in space flight --- for optimal astronaut performance
A78-47959
Method of evaluating the work capacity of pilots and astronauts
A78-47962
Method of investigating perceptual extrapolation
A78-47963

Radio telegraphy as a realistic test for investigating an astronaut's activity
A78-47964
Biological model of a self-adjusting filter
A78-47965
The astronaut in the astronavigation system of manned spacecraft
A78-47968
Human operator in a spacecraft control system during descent in the atmosphere
A78-47970
Manual control of astronaut attitude with a three-stage setup
A78-47971
Spaceflight stress factors and the ability to track
A78-47973
Adaptive systems of spacecraft control
A78-47975
Visual-motor coordination in the simulation of 10-day reduced gravity
A78-47976
Mechanisms of self-regulation of the functional system of tracking in normal and pathological states
A78-47979
Bioenergetics of control in the state of simulated weightlessness
A78-47980
Some aspects of depth perception in space
A78-47981
Ergonomic evaluation of cross-hair sights
A78-47982
Psychological state of the operator and visual evaluation of lunar relief
A78-47988
Peculiar characteristics of crewmembers' metabolism on the second expedition aboard orbital station Salyut-4
A78-48080
Spacesuit mobility joints
[NASA-CASE-ARC-11058-1] N78-31735

ASTRONAVIGATION
The astronaut in the astronavigation system of manned spacecraft
A78-47968
The recognition of objects against a model of cosmic sky
A78-47983
Detection of terrestrial landmarks during dark adaptation
A78-47984

ATMOSPHERIC COMPOSITION
Microorganisms of the upper layers of the atmosphere and protective role of their cell pigments
A78-48712

ATROPHY
Biochemical adaptations of antigravity muscle fibers to disuse atrophy
[NASA-CR-151822] N78-30796

ATROPINE
Effect of atropine upon the cerebrovascular system during GD-induced respiratory depression
[AD-A054807] N78-30811

ATTACK AIRCRAFT
Analysis of crew/cockpit models for advanced aircraft
[AD-A054957] N78-30824

ATTENTION
Residual attention as a predictor of pilot performance
A78-49274

ATTITUDE (INCLINATION)
Spatial disorientation in general aviation accidents
A78-48081

AUDIO FREQUENCIES
Pitch and formant analysis of the voice in the investigation of pilot workshop
N78-31750

AUDIOMETRY
The psychophysical tuning curve: A parametric study
N78-30807

AUDITORY TASKS
Auditory communication and workload --- human response time measurements to voice communication
N78-31749

AUTOMATA THEORY
Manipulators: Dynamics and algorithms --- Russian book
A78-48529

AUTONOMIC NERVOUS SYSTEM
Systems analysis of sympathetic functions
A78-48752

AVIONICS
The human operator simulator: Workload estimation using a simulated secondary task
N78-31756

B

BACILLUS
Dosimetric and biological results from the Bacillus subtilis Biostack experiment within the ASTP
A78-48598

BACTERIA
Methane-producing bacteria - Natural fractionations of the stable carbon isotopes
A78-47667
Archaebacteria --- biology and chemistry
A78-47891
Phytanyl-glycerol ethers and squalenes in the archaebacterium Methanobacterium thermoautotrophicum
A78-47892
Calcium transport in Halobacterium halobium envelope vesicles
A78-48574
Illumination-dependent changes in the intrinsic fluorescence of bacteriorhodopsin
A78-48578

BACTERIOPHAGES
Genetic effects of cosmic radiation on bacteriophage T4Br/+/ - On materials of biological experiment 'Soyuz-Apollo'
A78-48682

BEES
Hornet building orientation in a vertically rotating centrifuge
A78-48713

BIBLIOGRAPHIES
Biochemical oxygen demand, volume 2. A bibliography with abstracts
[NTIS/PS-78/0574/0] N78-30801
Biochemical oxygen demand, volume 3. A bibliography with abstracts
[NTIS/PS-78/0575/7] N78-30802
Hypothermia. A bibliography with abstracts
[NTIS/PS-78/0517/9] N78-30816
Bionics. A bibliography with abstracts
[NTIS/PS-78/0550/0] N78-31693
Cold weather stress on humans. A bibliography with abstracts
[NTIS/PS-78/0540/1] N78-31732

BIOASSAY
Variability of oxygen affinity of normal blood - An automated method of measurement
A78-47209
Cerebral energy state during or after hypoxia and complete or incomplete ischemia
A78-47210
Gravity as a biochemical determinant
A78-48671

BIOASTRONAUTICS
Method of animal training for biosatellite
A78-47110
Microbiological study of bioecological system. I --- for Spacelab
A78-47111
Man under conditions of weightlessness --- physiological effects
A78-47482
Sensory deprivation as a problem of prolonged space flights
A78-47484
The recognition of objects against a model of cosmic sky
A78-47983
Detection of terrestrial landmarks during dark adaptation
A78-47984
The action of space flight factors on radiation effects of additional gamma-irradiation of seeds
A78-48611

Biological investigations on the orbital station 'Salyut-5' A78-48679
Genetic effects of cosmic radiation on bacteriophage T4Br/+/ - Cm materials of biological experiment 'Soyuz-Apollo' A78-48682

BIOCHEMICAL OXYGEN DEMAND
Biochemical oxygen demand, volume 2. A bibliography with abstracts [NTIS/PS-78/0574/0] N78-30801
Biochemical oxygen demand, volume 3. A bibliography with abstracts [NTIS/PS-78/0575/7] N78-30802

BIOCHEMISTRY
Gravity as a biochemical determinant A78-48671

BIOCONTROL SYSTEMS
Mechanisms of self-regulation of the functional system of tracking in normal and pathological states A78-47979
Systems analysis of sympathetic functions A78-48752
Mathematical model of the contractile activity and the chronoinotropism of the myocardium A78-48755
Use of a mathematical model for identifying the role of the cardiac component in the regulation of hemodynamics A78-48757
Aspects of a systems approach to the analysis of the vascular mechanisms of the brain A78-48759
Investigation of the role of basic parameters of blood circulation in the regulation of hemodynamic by means of a mathematical model, identified in an experiment A78-48761

BIODYNAMICS
Elasticity of excised dog lung parenchyma A78-47206
Task-specific simulator pretraining and in-flight stress of student pilots A78-48085
Mechanisms of interaction between receptors of the vestibular system --- Russian book A78-48522

BIOELECTRICITY
Study of the specific effects of microwaves on the central nervous system. I - Demonstration of modifications of cerebral electrogenesis in the rat A78-46953
The microvibrations of the body, an index for examination stress A78-49297

BIOINSTRUMENTATION
Development and evaluation of an ultrasonic imaging system [PB-279834/6] N78-31729

BIOLOGICAL EFFECTS
Gravity as a biochemical determinant A78-48671
Hypergravity - Its effect on the estrous cycle and hormonal levels in female rats A78-48722
Effect of altered gravity on temperature regulation in mammals: Investigation of gravity effect on temperature regulation in mammals [NASA-CR-157570] N78-30797
Translations on USSR science and technology: Biomedical and behavioral sciences, no. 40. Effects on nonionizing electromagnetic radiation [JPRS-71595] N78-31705
Magnet effects in biology N78-31709
Late biological effects of ionizing radiation as influenced by dose, dose rate, age at exposure, and genetic sensitivity to neoplastic transformation [LA-UR-78-681] N78-31724
Federal noise research in noise effects [PB-280335/1] N78-31733

BIOLOGICAL EVOLUTION
The evolution of the earliest cells A78-47846
A measure of the denseness of a phylogenetic network --- by sequenced proteins from extant species A78-47890
Archaebacteria --- biology and chemistry A78-47891
Phytanyl-glycerol ethers and squalenes in the archaebacterium Methanobacterium thermoautotrophicum A78-47892
Neutral changes during divergent evolution of hemoglobins A78-47893
Evolution of sleep: Stages of formation of the wakefulness-sleep cycle in a number of vertebrates --- Russian book A78-48524

BIOMEDICAL DATA
Transcripts of the 40th meeting proceedings of National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research [PB-279916/1] N78-30815
Translations on USSR science and technology: Biomedical and Behavioral sciences, no. 39 [JPRS-71569] N78-31697

BIOMETRICS
An assessment of a N2O rebreathing method for the estimation of cardiac output during severe exercise A78-47492
Translations on USSR science and technology: Biomedical and behavioral sciences, no. 35 [JPRS-71467] N78-31694
Translations on USSR science and technology: Biomedical and behavioral sciences, no. 40. Effects on nonionizing electromagnetic radiation [JPRS-71595] N78-31705

BIONICS
Control of a flexible manipulator arm A78-47541
Biological model of a self-adjusting filter A78-47965
Analog simulation of the movements of an ideal manipulator A78-48511
Manipulators: Dynamics and algorithms --- Russian book A78-48529
Processes of learning complex behavior A78-49801
A general myocybernetic control model of skeletal muscle [CSIR-SR-WISK-280] N78-30809
Bionics. A bibliography with abstracts [NTIS/PS-78/0550/0] N78-31693

BIOPHYSICS
Mathematical model of the contractile activity and the chronoinotropism of the myocardium A78-48755
Modeling of the heart pumping function A78-48758
Investigation of the role of basic parameters of blood circulation in the regulation of hemodynamic by means of a mathematical model, identified in an experiment A78-48761
General approach to the modeling of the blood circulation A78-48762

BIOSPHERE
Translations on USSR science and technology: Biomedical and behavioral sciences, no. 40. Effects on nonionizing electromagnetic radiation [JPRS-71595] N78-31705
Coagulative properties of blood and tissues of the cardiovascular system in exposure to electromagnetic fields N78-31706
Proliferation of bone marrow cells under the influence of superhigh intensity steady magnetic fields N78-31707
Possibility of attenuating the ecological effects of alternating current power lines as a result of new designs and circuit changes N78-31708
Magnet effects in biology N78-31709

BIOSYNTHESIS
The 70 S monosome accumulation and in vitro initiation complex formation by Escherichia coli ribosomes at 5 C
[NASA-CR-157591] N78-31691
BIOTELEMETRY
Translations on USSR science and technology: Biomedical and Behavioral sciences, no. 39
[JPRS-71569] N78-31697
A variant of portable single-channel bioradictelemetry system
N78-31702
A method of recording heat parameters of divers during work
N78-31703
BLOOD
Blood gases at several levels of oxygenation in rats with a left-shifted blood oxygen dissociation curve
A78-50024
BLOOD CIRCULATION
Investigation of the role of basic parameters of blood circulation in the regulation of hemodynamic by means of a mathematical model, identified in an experiment
A78-48761
General approach to the modeling of the blood circulation
A78-48762
BLOOD COAGULATION
Coagulative properties of blood and tissues of the cardiovascular system in exposure to electromagnetic fields
N78-31706
BLOOD FLOW
Influence of posture on isometric fatigue
A78-47207
CSF pH and ventilatory acclimatization to altitude --- cerebrospinal fluid
A78-47208
BLOOD PUMPS
Modeling of the heart pumping function
A78-48758
BLOOD VESSELS
Aspects of a systems approach to the analysis of the vascular mechanisms of the brain
A78-48759
BODY KINEMATICS
Analog simulation of the movements of an ideal manipulator
A78-48511
BODY TEMPERATURE
Convergence of skin and rectal temperatures as a criterion for heat tolerance
A78-48083
Loss of circadian rhythmicity in body temperature and locomotor activity following suprachiasmatic lesions in the rat
A78-48576
Effect of altered gravity on temperature regulation in mammals: Investigation of gravity effect on temperature regulation in mammals
[NASA-CR-157570] N78-30797
Instrumentation for the measurement of the evaporative and radiative heat loss rates from man in a normal working mode
N78-30819
BOEING 720 AIRCRAFT
Inquest after a civil aviation accident - Personal experience
A78-46956
BONE MARROW
Proliferation of bone marrow cells under the influence of superhigh intensity steady magnetic fields
N78-31707
BONES
Electrical enhancement of healing in combat injuries to hard and soft tissues
[AD-A055531] N78-31718
BRAIN
Neurophysiological assessment of functional states of the brain --- electroencephalographic responses to workloads
N78-31755
BRAIN CIRCULATION
Aspects of a systems approach to the analysis of the vascular mechanisms of the brain
A78-48759
BREATHING APPARATUS
NGL advances --- valveless LOX converter for Tornado aircraft
A78-50085
The artificial gill: A study of its development, theory of operation, humanistic aspects, and design
N78-30805
BRINES
Growth of fungi in NaCl-MgSO4 brines
A78-48653
BURNS (INJURIES)
Laser-induced thermal damage of skin
[AD-A054612] N78-30810

C

CALCIUM
Calcium transport in Halobacterium halobium envelope vesicles
A78-48574
CARBOHYDRATE METABOLISM
Hypoxia tolerance in rats in relation to tissue glycogen levels
A78-48078
Age-related changes in glycolysis in the rat liver during high-altitude acclimatization
A78-49584
CARBON ISOTOPES
Methane-producing bacteria - Natural fractionations of the stable carbon isotopes
A78-47667
CARDIAC AURICLES
Atrial flutter - Electrocardiographic, vectorcardiographic and echocardiographic correlation
A78-49150
CARDIAC VENTRICLES
Investigation of the output of the left ventricle of the human heart
A78-48756
CARDIOGRAPHY
Electric impedance and mechanical recording, cardiovascular investigative methods in air medicine
A78-46951
CARDIOVASCULAR SYSTEM
Adaptive cardiovascular changes to physical training in spontaneously hypertensive and normotensive rats
A78-46981
Continuous metabolic and cardiovascular measurements on a monkey subject during a simulated 6-day Spacelab mission
A78-48719
Realignments of the cardiovascular system of a human operator under the action of negative gravity
A78-48760
Investigation of the role of basic parameters of blood circulation in the regulation of hemodynamic by means of a mathematical model, identified in an experiment
A78-48761
General approach to the modeling of the blood circulation
A78-48762
Coagulative properties of blood and tissues of the cardiovascular system in exposure to electromagnetic fields
N78-31706
CAROTID SINUS BODY
Measurements of potassium changes in the cat carotid body under hypoxia and hypercapnia
A78-49299
CASUALTIES
Inquest after a civil aviation accident - Personal experience
A78-46956
CELLS (BIOLOGY)
The evolution of the earliest cells
A78-47846
Is gravity a morphological determinant in plants at the cellular level
A78-48699
Proliferation of bone marrow cells under the influence of superhigh intensity steady magnetic fields
N78-31707

Analytical study of electrophoretic characterization of kidney cells --- conducted during the Apollo Soyuz Test Project
[NASA-CR-150790] N78-31713

CENTRAL NERVOUS SYSTEM
Study of the specific effects of microwaves on the central nervous system. I - Demonstration of modifications of cerebral electrogenesis in the rat
A78-46953

Effect of suprachiasmatic lesions on diurnal heart rate rhythm in the rat
A78-48580

CENTRIFUGING STRESS
Visual work capacity under the action of overloads and elevated temperature
A78-47972

Rat growth during chronic centrifugation
A78-48640

Hornet building orientation in a vertically rotating centrifuge
A78-48713

CEREBRAL VASCULAR ACCIDENTS
Effect of atropine upon the cerebrovascular system during GD-induced respiratory depression
[AD-A054807] N78-30811

CEREBROSPINAL FLUID
CSF pH and ventilatory acclimatization to altitude --- cerebrospinal fluid
A78-47208

CEREBRUM
Cerebral energy state during or after hypoxia and complete or incomplete ischemia
A78-47210

CHARACTER RECOGNITION
Biological model of a self-adjusting filter
A78-47965

CHEMICAL ELEMENTS
Study of reactive materials for development of new protective clothing concepts
[AD-A054877] N78-30826

CHEMICAL EVOLUTION
Chemical evolution and the origin of life
A78-47845

The genetic code as a periodic table
A78-47889

A measure of the denseness of a phylogenetic network --- by sequenced proteins from extant species
A78-47890

CHEMICAL FRACTIONATION
Methane-producing bacteria - Natural fractionations of the stable carbon isotopes
A78-47667

CHEMICAL PROPERTIES
A literature review: Problem definition studies on selected toxic chemicals. Volume 6: Occupational health and safety and environmental aspects of urea-formaldehyde resins
[AD-A054991] N78-31716

CHEMICAL REACTIONS
Assessment of free-living nitrogen fixing microorganisms for commercial nitrogen fixation --- economic analysis of ammonia production
[NASA-CR-157565] N78-30798

CHRONIC CONDITIONS
Rat growth during chronic centrifugation
A78-48640

CIRCADIAN RHYTHMS
Loss of circadian rhythmicity in body temperature and locomotor activity following suprachiasmatic lesions in the rat
A78-48576

Effect of suprachiasmatic lesions on diurnal heart rate rhythm in the rat
A78-48580

CLINICAL MEDICINE
SMD 3 post test medical report
[NASA-TM-79750] N78-30799

CLOSED ECOLOGICAL SYSTEMS
Microbiological study of bioecological system. I --- for Spacelab
A78-47111

Technology requirements for non-terrestrial ecosystems
A78-48666

CLOSURES
Spacesuit torso closure
[NASA-CASE-ARC-11100-1] N78-31736

COCKPITS
Perceived magnitudes of distortion, secondary imaging, and rainbowing in aircraft windshields
A78-49272

Analysis of crew/cockpit models for advanced aircraft
[AD-A054957] N78-30824

COGNITION
Involuntary automatic processing in color-naming tasks
A78-48825

COLD ACCLIMATIZATION
Metabolic and thermal responses of men wearing cold-protective clothing to various degrees of cold stress
A78-49298

Cold weather stress on humans. A bibliography with abstracts
[NTIS/PS-78/0540/1] N78-31732

COLD WEATHER
Cold weather stress on humans. A bibliography with abstracts
[NTIS/PS-78/0540/1] N78-31732

COLOR
Involuntary automatic processing in color-naming tasks
A78-48825

COMMUNICATION EQUIPMENT
A variant of portable single-channel bioradiotelemetry system
N78-31702

COMPUTER PROGRAMS
Description and analysis of the Hewlett-Packard 78220 arrhythmia monitoring system
[AD-A055451] N78-31720

COMPUTER TECHNIQUES
ORIS: The Oak Ridge Imaging System program listings
[ORNL-TM-5875-V3] N78-31722

COMPUTERIZED SIMULATION
Analog simulation of the movements of an ideal manipulator
A78-48511

Laser-induced thermal damage of skin
[AD-A054612] N78-30810

Analysis of crew/cockpit models for advanced aircraft
[AD-A054957] N78-30824

Mathematical analysis and computer simulation in military mission workload assessment
N78-31758

CONCORDE AIRCRAFT
Concorde and cosmic rays
A78-46952

CONFERENCES
Transcripts of the 40th meeting proceedings of National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research
[PB-279916/1] N78-30815

Methods to assess work load
[AGARD-CP-216] N78-31745

CONTRACTION
Analysis of the contractility of the myocardium of different heart chambers by means of comparing the isometric contraction of isolated stria and the strain-gage recording of isometric stress of the myocardium of an intact functioning heart
A78-48753

CONTROL SIMULATION
Dynamic decoupling of a remote manipulator system
A78-49257

CONTROL THEORY
A comparison of control modes for time delayed remote manipulation
N78-31737

CONTROLLABILITY
Dynamic decoupling of a remote manipulator system
A78-49257

COORDINATION
Visual-motor coordination in the simulation of 10-day reduced gravity
A78-47976

COSMIC RAYS
Concorde and cosmic rays
A78-46952

Genetic effects of cosmic radiation on bacteriophage T4Br/+/ - On materials of biological experiment 'Soyuz-Apollo'
A78-48682

COSMONAUTS
Characteristics of cosmonaut activities during flight --- Russian book
A78-47951
CRYOGENIC EQUIPMENT
Reliability test report. Modular cryogenic generator
[AD-A054855] N78-30825
CURVES (GEOMETRY)
The psychophysical tuning curve: A parametric study
N78-30807
CUSHIONS
A seat cushion to provide realistic acceleration cues for aircraft simulator pilots
[NASA-CASE-LAR-12149-2] N78-30821
CYSTEINE
Methionine transport in Halobacterium halobium vesicles - Noncompetitive, asymmetric inhibition by L-Cysteine
A78-48579

D

DARK ADAPTATION
The recognition of objects against a model of cosmic sky
A78-47983
Detection of terrestrial landmarks during dark adaptation
A78-47984
Visual evoked responses to the upper and lower half-field stimulation in a dark-adapted man
A78-50025
DECOUPLING
Dynamic decoupling of a remote manipulator system
A78-49257
DEOXYRIBONUCLEIC ACID
A special photoproduct in DNA, UV-irradiated in vacuo
A78-48623
DIAGNOSIS
Diagnostic improvements in medical ultrasonic imaging systems
N78-31710
DIGITAL DATA
Digital enhancement of computerized axial tomograms
[NASA-TM-78974] N78-31690
DISORIENTATION
Spatial disorientation in general aviation accidents
A78-48081
DISPLAY DEVICES
Effectiveness of basic display augmentation in vehicular control by visual field cues
A78-49262
A reaction time analysis of instrument scanning --- by aircraft pilots
A78-49275
Display size and target acquisition perforance
[AD-A054624] N78-31741
DIVING (UNDERWATER)
A method of recording heat parameters of divers during work
N78-31703
DOSIMETERS
Dosimetric and biological results from the Bacillus subtilis Biostack experiment within the ASTP
A78-48598
DYES
Strong sensitizers
[PB-280475/5] N78-31728
DYNAMIC CHARACTERISTICS
Design and construction of the Donner 280-crystal positron ring for dynamic transverse section emission imaging
[LBL-5679] N78-31721
DYNAMIC CONTROL
Manipulators: Dynamics and algorithms --- Russian book
A78-48529

E

EAR PROTECTORS
Application of commercially available filter components for psychoaccustic testing
A78-49898
EARTH ATMOSPHERE
Results of visual observations of the atmosphere and landscapes from manned spacecraft
A78-47989
EARTH SURFACE
Detection of terrestrial landmarks during dark adaptation
A78-47984
Results of visual observations of the atmosphere and landscapes from manned spacecraft
A78-47989
ECHOCARDIOGRAPHY
Atrial flutter - Electrocardiographic, vectorcardiographic and echocardiographic correlation
A78-49150
ECOLOGY
Possibility of attenuating the ecological effects of alternating current power lines as a result of new designs and circuit changes
N78-31708
ECONOMIC ANALYSIS
Assessment of free-living nitrogen fixing microorganisms for commercial nitrogen fixation --- economic analysis of ammonia production
[NASA-CR-157565] N78-30798
ECOSYSTEMS
Technology requirements for non-terrestrial ecosystems
A78-48666
Distribution of phytoplankton in Ohio lakes
[PB-280140/5] N78-30804
EDUCATION
Use of the occupational knowledge test to assign extra credit in selection of air traffic controllers
[AD-A053675] N78-30818
EFFERENT NERVOUS SYSTEMS
Loss of circadian rhythmicity in body temperature and locomotor activity following suprachiasmatic lesions in the rat
A78-48576
ELASTIC PROPERTIES
Elasticity of excised dog lung parenchyma
A78-47206
ELASTODYNAMICS
Control of a flexible manipulator arm
A78-47541
ELECTRIC CURRENT
Electrical enhancement of healing in combat injuries to hard and soft tissues
[AD-A055531] N78-31718
ELECTRIC STIMULI
Electroreceptors in man and other animals
N78-31696
ELECTRICAL IMPEDANCE
Electric impedance and mechanical recording, cardiovascular investigative methods in air medicine
A78-46951
ELECTROCARDIOGRAPHY
Contribution to the diagnosis of painless ischemic cardiopathy in flight personnel
A78-46957
Atrial flutter - Electrocardiographic, vectorcardiographic and echocardiographic correlation
A78-49150
Description and analysis of the Hewlett-Packard 78220 arrhythmia monitoring system
[AD-A055451] N78-31720
ELECTROENCEPHALOGRAPHY
Study of the specific effects of microwaves on the central nervous system. I - Demonstration of modifications of cerebral electrogenesis in the rat
A78-46953
Neurophysiological assessment of functional states of the brain --- electroencephalographic responses to workloads
N78-31755
ELECTROMAGNETIC FIELDS
Coagulative properties of blood and tissues of the cardiovascular system in exposure to electromagnetic fields
N78-31706

ELECTROMAGNETIC RADIATION
Translations on USSR science and technology: Biomedical and behavioral sciences, no. 40. Effects on nonionizing electromagnetic radiation [JPRS-71595] N78-31705
ELECTRON MICROSCOPY
Spectrophotofluorometric and electron microscopic study of lipofuscin accumulation in the testis of aging mice A78-48581
ELECTRONIC CONTROL
Method of evaluating the work capacity of pilots and astronauts A78-47962
ELECTRONIC FILTERS
Application of commercially available filter components for psychoacoustic testing A78-49898
ELECTRONYSTAGMOGRAPHY
Effects of partial body weightlessness on the vestibulo-ocular reflex in man A78-47112
ELECTROPHORESIS
Analytical study of electrophoretic characterization of kidney cells --- conducted during the Apollo Soyuz Test Project [NASA-CR-150790] N78-31713
ELECTROPHYSIOLOGY
Biological model of a self-adjusting filter A78-47965
Susceptibility of the cat's visual system to hypoxia, hypotonia and circulatory arrest A78-49300
Translations on USSR science and technology: Biomedical and behavioral sciences, no. 35 [JPRS-71467] N78-31694
Electroreceptors in man and other animals N78-31696
EMBRYOLOGY
Studies on adenine acid-soluble nucleotides content in the liver of gamma-irradiated chicken embryos A78-48442
Biological investigations on the orbital station 'Salyut-5' A78-48679
Is gravity a morphological determinant in plants at the cellular level A78-48699
EMOTIONAL FACTORS
Information processing under emotionally saturated conditions of activity A78-47957
Emotional state and orthostatic reactions A78-47960
Psychological state of the operator and visual evaluation of lunar relief A78-47988
Behavior therapy and the treatment of flight phobia A78-48086
ENERGY SOURCES
Fermentation and hydrocarbons [LBL-7270] N78-30800
ENVIRONMENT EFFECTS
Federal noise research in noise effects [PB-280335/1] N78-31733
ENVIRONMENT MANAGEMENT
Man-environment studies: A review with an analysis of some techniques for the assessment of environmental perception [CSIR-SR-PERS-271] N78-30817
ENVIRONMENT PROTECTION
A literature review: Problem definition studies on selected toxic chemicals. Volume 6: Occupational health and safety and environmental aspects of urea-formaldehyde resins [AD-A054991] N78-31716
ENVIRONMENTAL CONTROL
Hypoxia survival variations in male and female mice as functions of chronological and environmental factors A78-48082
ENZYME ACTIVITY
Methionine transport in Halobacterium halobium vesicles - Noncompetitive, asymmetric inhibition by L-Cysteine A78-48579
Changes of closely related enzymes and minerals to neuro-muscular systems of albino rats, during prolonged exposure to simulated hypogravics A78-48645
EQUATIONS OF MOTION
Control of a flexible manipulator arm A78-47541
ERYTHROCYTES
Variability of oxygen affinity of normal blood - An automated method of measurement A78-47209
ESCHERICHIA
A special photoproduct in DNA, UV-irradiated in vacuo A78-48623
The 70 S monosome accumulation and in vitro initiation complex formation by Escherichia coli ribosomes at 5 C [NASA-CR-157591] N78-31691
ESTIMATING
The human operator simulator: Workload estimation using a simulated secondary task N78-31756
ETHERS
Phytanyl-glycerol ethers and squalenes in the archaebacterium Methanobacterium thermoautotrophicum A78-47892
EUTROPHICATION
Distribution of phytoplankton in Ohio lakes [PB-280140/5] N78-30804
EVAPORATION RATE
Instrumentation for the measurement of the evaporative and radiative heat loss rates from man in a normal working mode N78-30819
EVOKED RESPONSE (PSYCHOPHYSIOLOGY)
Visual evoked responses to the upper and lower half-field stimulation in a dark-adapted man A78-50025
EXOBIOLOGY
Growth of fungi in NaCl-MgSO4 brines A78-48653
EXTRAVEHICULAR ACTIVITY
Evolution of the space suit N78-31695
EYE (ANATOMY)
Movements of the eyes --- Book A78-48506
An experimental investigation of the effect of 1.06 micrometers laser light on the transparent ocular media [AD-A055650] N78-31719
EYE MOVEMENTS
Choice and analytic techniques involving indices of visual information input. I A78-46954
Movements of the eyes --- Book A78-48506
Methodological considerations of visual workloads of helicopter pilots --- eye movement measurements N78-31747

F

FAILURE ANALYSIS
Urine monitoring system failure analysis and operational verification test report [NASA-CR-151828] N78-30820
FEAR OF FLYING
Behavior therapy and the treatment of flight phobia A78-48086
FEMALES
Hypergravity - Its effect on the estrous cycle and hormonal levels in female rats A78-48722
FERMENTATION
Fermentation and hydrocarbons [LBL-7270] N78-30800
FISHES
Behavior, ecology and toxicity of venomous marine fishes [AD-A054925] N78-31692
FLAMMABILITY
Hazards of organic working fluids [BNL-50761] N78-31725

FLIGHT ALTITUDE
Psychophysiological characteristics of pilot activity during low-altitude flights over the sea
A78-48410
FLIGHT CREWS
Contribution to the diagnosis of painless ischemic cardiopathy in flight personnel
A78-46957
Molecular sieve generation of aviator's oxygen: Breathing gas composition as a function of flow, inlet pressure, and cabin altitude
[AD-A054240] N78-30822
Preliminary analysis of available inflight respiratory data
[AD-A054241] N78-30823
Reliability test report. Modular cryogenic generator
[AD-A054855] N78-30825
Methods to assess work load
[AGARD-CP-216] N78-31745
Is man the weakest link? --- real time activity recording of aircrew workloads
N78-31746
Operator workload assessment model: An evaluation of a VF/VA-V/STOL system
N78-31757
Mathematical analysis and computer simulation in military mission workload assessment
N78-31758
FLIGHT FATIGUE
Sensory deprivation as a problem of prolonged space flights
A78-47484
FLIGHT PATHS
Simulator study for the determination of the demands upon the pilot in the case of unconventional, spatially curved approach profiles --- German thesis
A78-49406
FLIGHT SAFETY
Spatial disorientation in general aviation accidents
A78-48081
FLIGHT SIMULATION
A pilot evaluation of two G-seat cueing schemes
[NASA-TP-1255] N78-31739
FLIGHT SIMULATORS
Simulator study for the determination of the demands upon the pilot in the case of unconventional, spatially curved approach profiles --- German thesis
A78-49406
A seat cushion to provide realistic acceleration cues for aircraft simulator pilots
[NASA-CASE-LAR-12149-2] N78-30821
US Navy fleet aviation training program development
[AD-A055788] N78-31734
FLIGHT STRESS
Use of Inspiratory Minute Volumes in evaluation of rotary and fixed wing pilot workload --- respiratory response to flight conditions
N78-31754
FLIGHT STRESS (BIOLOGY)
Method of animal training for biosatellite
A78-47110
Information processing under emotionally saturated conditions of activity
A78-47957
Task-specific simulator pretraining and in-flight stress of student pilots
A78-48085
Behavior therapy and the treatment of flight phobia
A78-48086
Altitude tolerance of general aviation pilots with normal or partially impaired spirometric function
A78-48088
FLIGHT TRAINING
US Navy fleet aviation training program development
[AD-A055788] N78-31734
FLOW CHARACTERISTICS
Factors determining maximal expiratory flows in the human lung
N78-31711
FLUIDICS
An evaluation of the fluidic oxygen partial pressure sensor
[AD-A055362] N78-31743
FLUORESCENCE
Illumination-dependent changes in the intrinsic fluorescence of bacteriorhodopsin
A78-48578
Spectrophotofluorometric and electron microscopic study of Lipofuscin accumulation in the testis of aging mice
A78-48581
FUNCTIONAL ANALYSIS
Neurophysiological assessment of functional states of the brain --- electroencephalographic responses to workloads
N78-31755
FUNGI
Growth of fungi in NaCl-MgSO4 brines
A78-48652

G

GAMMA RAYS
Studies on adenine acid-soluble nucleotides content in the liver of gamma-irradiated chicken embryos
A78-48442
The action of space flight factors on radiation effects of additional gamma-irradiation of seeds
A78-48611
GARMENTS
Spacesuit torso closure
[NASA-CASE-ARC-11100-1] N78-31736
GAS DISSOCIATION
Blood gases at several levels of oxygenation in rats with a left-shifted blood oxygen dissociation curve
A78-50024
GAS TRANSPORT
Blood gases at several levels of oxygenation in rats with a left-shifted blood oxygen dissociation curve
A78-50024
GASTROINTESTINAL SYSTEM
The gastrointestinal tract in hypokinetic rats
A78-48587
GENERAL AVIATION AIRCRAFT
Spatial disorientation in general aviation accidents
A78-48081
GENETIC CODE
Genetic code correlations - Amino acids and their anticodon nucleotides
A78-47888
The genetic code as a periodic table
A78-47889
GENETICS
A measure of the denseness of a phylogenetic network --- by sequenced proteins from extant species
A78-47890
Biological investigations on the orbital station 'Salyut-5'
A78-48679
Genetic effects of cosmic radiation on bacteriophage T4Br/+/ - On materials of biological experiment 'Soyuz-Apollo'
A78-48682
Translations on USSR science and technology: Biomedical and Behavioral sciences, no. 39
[JPRS-71569] N78-31697
Genetics of microorganisms and medicine
N78-31698
Some pressing problems of genetics
N78-31699
GEOTROPISM
Simulation of circumnutations - Behaviour under different g's --- of plants
A78-48684
GLYCEROLS
Phytanyl-glycerol ethers and squalenes in the archaebacterium Methanobacterium thermoautotrophicum
A78-47892
GLYCOGENS
Hypoxia tolerance in rats in relation to tissue glycogen levels
A78-48078
GLYCOLYSIS
Age-related changes in glycolysis in the rat liver during high-altitude acclimatization
A78-49584

GRAVIRECEPTORS
Mechanisms of interaction between receptors of the vestibular system --- Russian book
A78-48522
GRAVITATIONAL EFFECTS
Effect of gravity on lymphocyte activation
A78-48604
Responses of roots to simulated weightlessness on the fast rotating klinostat
A78-48667
Gravity as a biochemical determinant
A78-48671
Effects of simulated hypogravity on respiration and photosynthesis of higher plants
A78-48680
Simulation of circumnutations - Behaviour under different g's --- of plants
A78-48684
Is gravity a morphological determinant in plants at the cellular level
A78-48699
Hornet building orientation in a vertically rotating centrifuge
A78-48713
Hypergravity - Its effect on the estrous cycle and hormonal levels in female rats
A78-48722
Realignments of the cardiovascular system of a human operator under the action of negative gravity
A78-48760
Effect of altered gravity on temperature regulation in mammals: Investigation of gravity effect on temperature regulation in mammals
[NASA-CR-157570] N78-30797
GROUND EFFECT MACHINES
Vibration aspects of ride quality modeling for the DOT TTACV: Theory and experiment
[PB-279846/0] N78-31744
GROUP DYNAMICS
Suggestibility and characterological features of personality
A78-47961
GROWTH
Rat growth during chronic centrifugation
A78-48640

H

HALOPHILES
Archaebacteria --- biology and chemistry
A78-47891
Calcium transport in Halobacterium halobium envelope vesicles
A78-48574
Growth of fungi in NaCl-MgSO4 brines
A78-48653
HEAD MOVEMENT
Head rotational spectral characteristics during two-dimensional smooth pursuit tasks
A78-49263
HEALTH PHYSICS
Concorde and cosmic rays
A78-46952
A literature review: Problem definition studies on selected toxic chemicals. Volume 6: Occupational health and safety and environmental aspects of urea-formaldehyde resins
[AD-A054991] N78-31716
Nitrogen oxides: Current status of knowledge
[EPRI-EA-668] N78-31723
HEARING
Effects of noise and hearing acuity upon visual depth perception and safety among humans
[PB-280365/8] N78-30812
HEART DISEASES
Contribution to the diagnosis of painless ischemic cardiopathy in flight personnel
A78-46957
Atrial flutter - Electrocardiographic, vectorcardiographic and echocardiographic correlation
A78-49150
HEART FUNCTION
An assessment of a N2O rebreathing method for the estimation of cardiac output during severe exercise
A78-47492
Substrate effects on myocardial performance during normoxia and hypoxia
A78-47949
Analysis of the contractility of the myocardium of different heart chambers by means of comparing the isometric contraction of isolated stria and the strain-gage recording of isometric stress of the myocardium of an intact functioning heart
A78-48753
Analysis of energy metabolism of a functioning heart during hypoxia and variations of functional loading
A78-48754
Mathematical model of the contractile activity and the chronotropism of the myocardium
A78-48755
Investigation of the output of the left ventricle of the human heart
A78-48756
Use of a mathematical model for identifying the role of the cardiac component in the regulation of hemodynamics
A78-48757
Modeling of the heart pumping function
A78-48758
HEART MINUTE VOLUME
Altitude tolerance of general aviation pilots with normal or partially impaired spirometric function
A78-48088
HEART RATE
Effect of suprachiasmatic lesions on diurnal heart rate rhythm in the rat
A78-48580
HEAT ACCLIMATIZATION
Convergence of skin and rectal temperatures as a criterion for heat tolerance
A78-48083
Hormonal responses of sedentary and exercising men to recurrent heat exposure
A78-48084
HEAT TOLERANCE
Convergence of skin and rectal temperatures as a criterion for heat tolerance
A78-48083
Hormonal responses of sedentary and exercising men to recurrent heat exposure
A78-48084
HEMODYNAMIC RESPONSES
Substrate effects on myocardial performance during normoxia and hypoxia
A78-47949
Emotional state and orthostatic reactions
A78-47960
HEMODYNAMICS
Adaptive cardiovascular changes to physical training in spontaneously hypertensive and normotensive rats
A78-46981
Use of a mathematical model for identifying the role of the cardiac component in the regulation of hemodynamics
A78-48757
Investigation of the role of basic parameters of blood circulation in the regulation of hemodynamic by means of a mathematical model, identified in an experiment
A78-48761
General approach to the modeling of the blood circulation
A78-48762
HEMOGLOBIN
Neutral changes during divergent evolution of hemoglobins
A78-47893
HEMORRHAGES
Retinal hemorrhage in high mountain climbers
A78-47113
HIGH ALTITUDE BREATHING
NGL advances --- valveless LOX converter for Tornado aircraft
A78-50085
HIGH ALTITUDE ENVIRONMENTS
Retinal hemorrhage in high mountain climbers
A78-47113
The effect of high altitude on pyridine nucleotides and adenosine phosphates in the liver of the rat
N78-31689

HIGH PRESSURE
Work Capability and physiological effects Predictive studies. 4: in HE-02 excursions to pressures of 400-800-1200- and 1600 feet of sea water
[NASA-CR-157571] N78-31714
HIGH PRESSURE OXYGEN
State of hypothalamo-hypophyseal neurosecretory system during hyperbaric oxygenation
A78-49700
HIGH VACUUM
A special photoproduct in DNA, UV-irradiated in vacuo
A78-48623
HISTOCHEMICAL ANALYSIS
The gastrointestinal tract in hypokinetic rats
A78-48587
HISTOLOGY
Laser-induced thermal damage of skin
[AD-A054612] N78-30810
HONEYCOMB STRUCTURES
Hornet building orientation in a vertically rotating centrifuge
A78-48713
HORMONE METABOLISMS
Hormonal responses of sedentary and exercising men to recurrent heat exposure
A78-48084
Hypergravity - Its effect on the estrous cycle and hormonal levels in female rats
A78-48722
HUMAN BEHAVIOR
Behavior therapy and the treatment of flight phobia
A78-48086
Describing the human operator's internal model of a dynamic system
A78-49273
Transcripts of the 40th meeting proceedings of National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research
[PB-279916/1] N78-30815
HUMAN BODY
Biological significance of some metals as air pollutants. Part 2: Mercury
[PB-279670/4] N78-30814
Instrumentation for the measurement of the evaporative and radiative heat loss rates from man in a normal working mode
N78-30819
Air quality criteria for lead
[PB-280411/0] N78-31730
Cold weather stress on humans. A bibliography with abstracts
[NTIS/PS-78/0540/1] N78-31732
HUMAN FACTORS ENGINEERING
Adaptive systems of spacecraft control
A78-47975
Ergonomic evaluation of cross-hair sights
A78-47982
Effect of spectral filtering during continuous two-day work
A78-47986
Use of the occupational knowledge test to assign extra credit in selection of air traffic controllers
[AD-A053675] N78-30818
Analysis of crew/cockpit models for advanced aircraft
[AD-A054957] N78-30824
Contrast sensitivity of the human visual system at one luminance level while adapted to a stimulus at another luminance level
[AD-A055238] N78-31717
Spacesuit motility joints
[NASA-CASE-ARC-11058-1] N78-31735
Spacesuit torso closure
[NASA-CASE-ARC-11100-1] N78-31736
Methods to assess work load
[AGARD-CP-216] N78-31745
The human operator simulator: Workload estimation using a simulated secondary task
N78-31756
Operator workload assessment model: An evaluation of a VF/VA-V/STOL system
N78-31757
HUMAN PATHOLOGY
Mechanisms of self-regulation of the functional system of tracking in normal and pathological states
A78-47979
HUMAN PERFORMANCE
Performance, mood, and clinical symptoms in men exposed to prolonged, severe physical work and sleep deprivation
A78-48079
Head rotational spectral characteristics during two-dimensional smooth pursuit tasks
A78-49263
Predicting the effects of dual-frequency vertical vibration on continuous manual control performance
A78-50081
Determination of stress and strain of air traffic control officers --- physiological response measurements
N78-31751
Physiological measures of workloads: Correlations between physiological parameters and operational performance
N78-31753
HUMAN REACTIONS
Objective workload and behavioural response in airport radar control rooms
A78-47491
The effect of rotational vibration in roll and pitch axes on the discomfort of seated subjects
A78-50080
The stability of equal sensation contours for whole-body vibration
A78-50082
HUMAN TOLERANCES
Effects of noise and hearing acuity upon visual depth perception and safety among humans
[PB-280365/8] N78-30812
The vibrating environment in transport vehicles: A critical bibliographical study --- human tolerance to vibratory loads
[RAE-LIB-TRANS-1917] N78-31738
HYBRID STRUCTURES
Control of a flexible manipulator arm
A78-47541
HYDROCARBONS
Fermentation and hydrocarbons
[LBL-7270] N78-30800
HYPERBARIC CHAMBERS
State of hypothalamo-hypophyseal neurosecretory system during hyperbaric oxygenation
A78-49700
HYPERCAPNIA
Measurements of potassium changes in the cat carotid body under hypoxia and hypercapnia
A78-49299
HYPEROXIA
State of hypothalamo-hypophyseal neurosecretory system during hyperbaric oxygenation
A78-49700
HYPERTHERMIA
Visual work capacity under the action of overloads and elevated temperature
A78-47972
HYPNOSIS
Psychological model of weightlessness in space flight simulation
A78-47958
Emotional state and orthostatic reactions
A78-47960
Suggestibility and characterological features of personality
A78-47961
Bioenergetics of control in the state of simulated weightlessness
A78-47980
HYPOKINESIA
The gastrointestinal tract in hypokinetic rats
A78-48587
HYPOTHALAMUS
State of hypothalamo-hypophyseal neurosecretory system during hyperbaric oxygenation
A78-49700
HYPOTHERMIA
Hypothermia. A bibliography with abstracts
[NTIS/PS-78/0517/9] N78-30816

HYPOTONIA
Susceptibility of the cat's visual system to hypoxia, hypotonia and circulatory arrest A78-49300
HYPOXIA
Cerebral energy state during or after hypoxia and complete or incomplete ischemia A78-47210
Substrate effects on myocardial performance during normoxia and hypoxia A78-47949
Hypoxia tolerance in rats in relation to tissue glycogen levels A78-48078
Hypoxia survival variations in male and female mice as functions of chronological and environmental factors A78-48082
Analysis of energy metabolism of a functioning heart during hypoxia and variations of functional loading A78-48754
Measurements of potassium changes in the cat carotid body under hypoxia and hypercapnia A78-49299
Susceptibility of the cat's visual system to hypoxia, hypotonia and circulatory arrest A78-49300
Blood gases at several levels of oxygenation in rats with a left-shifted blood oxygen dissociation curve A78-50024
The effect of high altitude on pyridine nucleotides and adenosine phosphates in the liver of the rat N78-31689
Physiological measures of workloads: Correlations between physiological parameters and operational performance N78-31753

I

ILLUMINATION
Illumination-dependent changes in the intrinsic fluorescence of bacteriorhodopsin A78-48578
IMAGE CONTRAST
The recognition of objects against a model of cosmic sky A78-47983
Contrast sensitivity of the human visual system at one luminance level while adapted to a stimulus at another luminance level [AD-A055238] N78-31717
IMAGE ENHANCEMENT
Digital enhancement of computerized axial tomograms [NASA-TM-78974] N78-31690
IMAGE PROCESSING
ORIS: The Oak Ridge Imaging System program listings [ORNL-TM-5875-V3] N78-31722
IMAGERY
Diagnostic improvements in medical ultrasonic imaging systems N78-31710
IMAGING TECHNIQUES
Design and construction of the Donner 280-crystal positron ring for dynamic transverse section emission imaging [LBL-5679] N78-31721
IMMUNOLOGY
Effect of gravity on lymphocyte activation A78-48604
IN-FLIGHT MONITORING
Urine monitoring system failure analysis and operational verification test report [NASA-CR-151828] N78-30820
Preliminary analysis of available inflight respiratory data [AD-A054241] N78-30823
Is man the weakest link? --- real time activity recording of aircrew workloads N78-31746
INDEPENDENT VARIABLES
The psychophysical tuning curve: A parametric study N78-30807
INDUSTRIAL SAFETY
Translations on USSR science and technology: Biomedical and Behavioral sciences, no. 39 [JPRS-71569] N78-31697
INDUSTRIAL WASTES
Biochemical oxygen demand, volume 2. A bibliography with abstracts [NTIS/PS-78/0574/0] N78-30801
Biochemical oxygen demand, volume 3. A bibliography with abstracts [NTIS/PS-78/0575/7] N78-30802
INFRARED LASERS
Development and evaluation of an ultrasonic imaging system [PB-279834/6] N78-31729
INJURIES
Inquest after a civil aviation accident - Personal experience A78-46956
Electrical enhancement of healing in combat injuries to hard and soft tissues [AD-A055531] N78-31718
INSECTICIDES
Toxicological evaluation of Pyrethrins Fogging Concentrate (trade name) study No. 51-1309-78 [AD-A055088] N78-31715
IODINE
Disposal of radioactive iodine in space [NASA-TT-1313] N78-31740
ION EXCHANGE MEMBRANE ELECTROLYTES
Measurements of potassium changes in the cat carotid body under hypoxia and hypercapnia A78-49299
IONIZING RADIATION
Dependence of the reaction of the human nervous system on the distribution of absorbed doses of ionizing radiation N78-31704
Late biological effects of ionizing radiation as influenced by dose, dose rate, age at exposure, and genetic sensitivity to neoplastic transformation [LA-UR-78-681] N78-31724
ISCHEMIA
Contribution to the diagnosis of painless ischemic cardiopathy in flight personnel A78-46957
Cerebral energy state during or after hypoxia and complete or incomplete ischemia A78-47210

J

JOINTS (JUNCTIONS)
Spacesuit mobility joints [NASA-CASE-ARC-11058-1] N78-31735

K

KIDNEYS
Analytical study of electrophoretic characterization of kidney cells --- conducted during the Apollo Soyuz Test Project [NASA-CR-150790] N78-31713

L

LAKES
Distribution of phytoplankton in Tennessee lakes [PB-280139/7] N78-30803
Distribution of phytoplankton in Ohio lakes [PB-280140/5] N78-30804
LANDMARKS
Detection of terrestrial landmarks during dark adaptation A78-47984
LASER DAMAGE
Laser-induced thermal damage of skin [AD-A054612] N78-30810
LASERS
An experimental investigation of the effect of 1.06 micrometers laser light on the transparent ocular media [AD-A055650] N78-31719
LEAD (METAL)
Air quality criteria for lead [PB-280411/0] N78-31730

LEAKAGE
Hazards of organic working fluids
[BNI-50761] N78-31725
LEARNING MACHINES
Biological model of a self-adjusting filter
A78-47965
LEARNING THEORY
Processes of learning complex behavior
A78-49801
LENSES
An experimental investigation of the effect of 1.06 micrometers laser light on the transparent ocular media
[AD-A055650] N78-31719
LESIONS
Loss of circadian rhythmicity in body temperature and locomotor activity following suprachiasmatic lesions in the rat
A78-48576
LETHALITY
Behavior, ecology and toxicity of venomous marine fishes
[AD-A054925] N78-31692
LEVITATION
Vibration aspects of ride quality modeling for the DOT PTACV: Theory and experiment
[PB-279846/0] N78-31744
LIFE SUPPORT SYSTEMS
Technology requirements for non-terrestrial ecosystems
A78-48666
The artificial gill: A study of its development, theory of operation, humanistic aspects, and design
N78-30805
Reliability test report. Modular cryogenic generator
[AD-A054855] N78-30825
An evaluation of the fluidic oxygen partial pressure sensor
[AD-A055362] N78-31743
LIGHT ADAPTATION
Contrast sensitivity of the human visual system at one luminance level while adapted to a stimulus at another luminance level
[AD-A055238] N78-31717
LIGHT SCATTERING
An experimental investigation of the effect of 1.06 micrometers laser light on the transparent ocular media
[AD-A055650] N78-31719
LIGHT TRANSMISSION
Perceived magnitudes of distortion, secondary imaging, and rainbowing in aircraft windshields
A78-49272
LIMNOLOGY
Biochemical oxygen demand, volume 2. A bibliography with abstracts
[NTIS/PS-78/0574/0] N78-30801
Biochemical oxygen demand, volume 3. A bibliography with abstracts
[NTIS/PS-78/0575/7] N78-30802
LIPIDS
Phytanyl-glycerol ethers and squalenes in the archaebacterium Methanobacterium thermoautotrophicum
A78-47892
LIPOPROTEINS
Spectrophotofluorometric and electron microscopic study of lipofuscin accumulation in the testis of aging mice
A78-48581
LIQUID OXYGEN
NGL advances --- valveless LOX converter for Tornado aircraft
A78-50085
Reliability test report. Modular cryogenic generator
[AD-A054855] N78-30825
LIVER
Studies on adenine acid-soluble nucleotides content in the liver of gamma-irradiated chicken embryos
A78-48442
Age-related changes in glycolysis in the rat liver during high-altitude acclimatization
A78-49584
The effect of high altitude on pyridine nucleotides and adenosine phosphates in the liver of the rat
N78-31689
LOCOMOTION
Loss of circadian rhythmicity in body temperature and locomotor activity following suprachiasmatic lesions in the rat
A78-48576
LONG TERM EFFECTS
Hypoxia survival variations in male and female mice as functions of chronological and environmental factors
A78-48082
Rat growth during chronic centrifugation
A78-48640
Late biological effects of ionizing radiation as influenced by dose, dose rate, age at exposure, and genetic sensitivity to neoplastic transformation
[LA-UR-78-681] N78-31724
LONGEVITY
Longevity in military pilots - 37-year followup of the Navy's '1000 Aviators'
A78-48087
LOW ALTITUDE
Psychophysiological characteristics of pilot activity during low-altitude flights over the sea
A78-48410
LUMINOUS INTENSITY
Contrast sensitivity of the human visual system at one luminance level while adapted to a stimulus at another luminance level
[AD-A055238] N78-31717
LUNAR SURFACE
Visual evaluation of simulated elements of lunar relief
A78-47987
Psychological state of the operator and visual evaluation of lunar relief
A78-47988
LUNGS
Factors determining maximal expiratory flows in the human lung
N78-31711
LYMPHOCYTES
Effect of gravity on lymphocyte activation
A78-48604

M

MAGNETIC FIELDS
Electroreceptors in man and other animals
N78-31696
Proliferation of bone marrow cells under the influence of superhigh intensity steady magnetic fields
N78-31707
Magnet effects in biology
N78-31709
MAN ENVIRONMENT INTERACTIONS
Man-environment studies: A review with an analysis of some techniques for the assessment of environmental perception
[CSIR-SR-PERS-271] N78-30817
MAN MACHINE SYSTEMS
Choice and analytic techniques involving indices of visual information input. I
A78-46954
Method of evaluating the work capacity of pilots and astronauts
A78-47962
Method of investigating perceptual extrapolation
A78-47963
The astronaut in the astronavigation system of manned spacecraft
A78-47968
Operator activity in a state of continuous wakefulness
A78-47969
Human operator in a spacecraft control system during descent in the atmosphere
A78-47970
Adaptive systems of spacecraft control
A78-47975
Describing the human operator's internal model of a dynamic system
A78-49273

MANIPULATORS
Control of a flexible manipulator arm
A78-47541
Manual control of astronaut attitude with a three-stage setup
A78-47971
Analog simulation of the movements of an ideal manipulator
A78-48511
Manipulators: Dynamics and algorithms --- Russian book
A78-48529
Dynamic decoupling of a remote manipulator system
A78-49257
A comparison of control modes for time delayed remote manipulation
N78-31737

MANNED REENTRY
Human operator in a spacecraft control system during descent in the atmosphere
A78-47970

MANNED SPACE FLIGHT
The astronaut in the astronavigation system of manned spacecraft
A78-47968
Results of visual observations of the atmosphere and landscapes from manned spacecraft
A78-47989
Evolution of the space suit
N78-31695

MANUAL CONTROL
The astronaut in the astronavigation system of manned spacecraft
A78-47968
Describing the human operator's internal model of a dynamic system
A78-49273
Predicting the effects of dual-frequency vertical vibration on continuous manual control performance
A78-50081
Is man the weakest link? --- real time activity recording of aircrew workloads
N78-31746

MARS SURFACE
Volcanism and soil mercury on Mars - Consequences for terrestrial microorganisms
A78-48670

MATHEMATICAL MODELS
General approach to the modeling of the blood circulation
A78-48762
A general myocybernetic control model of skeletal muscle
[CSIR-SR-WISK-280] N78-30809
Mathematical analysis and computer simulation in military mission workload assessment
N78-31758

MECHANOGRAMS
Electric impedance and mechanical recording, cardiovascular investigative methods in air medicine
A78-46951

MECHANORECEPTORS
Mechanisms of interaction between receptors of the vestibular system --- Russian book
A78-49522

MEDICAL ELECTRONICS
Description and analysis of the Hewlett-Packard 78220 arrhythmia monitoring system
[AD-A055451] N78-31720

MEDICAL SCIENCE
Transcripts of the 40th meeting proceedings of National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research
[PB-279916/1] N78-30815
Genetics of microorganisms and medicine
N78-31698
Some pressing problems of genetics
N78-31699

MEMBRANES
Calcium transport in Halobacterium halobium envelope vesicles
A78-48574
Methionine transport in Halobacterium halobium vesicles - Noncompetitive, asymmetric inhibition by L-Cysteine
A78-48579

MENTAL HEALTH
Crises of maladaptation in confirmed pilots
A78-46959

MENTAL PERFORMANCE
Information processing under emotionally saturated conditions of activity
A78-47957
Processes of learning complex behavior
A78-49801

MERCURY (METAL)
Volcanism and soil mercury on Mars - Consequences for terrestrial microorganisms
A78-48670
Biological significance of some metals as air pollutants. Part 2: Mercury
[PB-279670/4] N78-30814

METABOLISM
Cerebral energy state during or after hypoxia and complete or incomplete ischemia
A78-47210
Substrate effects on myocardial performance during normoxia and hypoxia
A78-47949
Peculiar characteristics of crewmembers' metabolism on the second expedition aboard orbital station Salyut-4
A78-48080
Continuous metabolic and cardiovascular measurements on a monkey subject during a simulated 6-day Spacelab mission
A78-48719
Systems analysis of sympathetic functions
A78-48752
Metabolic and thermal responses of men wearing cold-protective clothing to various degrees of cold stress
A78-49298

METALS
Toxicology of metals, volume 3
[PB-280115/7] N78-30813

METHANE
Methane-producing bacteria - Natural fractionations of the stable carbon isotopes
A78-47667
Archaebacteria --- biology and chemistry
A78-47891

METHIONINE
Methionine transport in Halobacterium halobium vesicles - Noncompetitive, asymmetric inhibition by L-Cysteine
A78-48579

MICROBIOLOGY
Microbiological study of bioecological system. I --- for Spacelab
A78-47111

MICROORGANISMS
The evolution of the earliest cells
A78-47846
Volcanism and soil mercury on Mars - Consequences for terrestrial microorganisms
A78-48670
Microorganisms of the upper layers of the atmosphere and protective role of their cell pigments
A78-48712
Assessment of free-living nitrogen fixing microorganisms for commercial nitrogen fixation --- economic analysis of ammonia production
[NASA-CR-157565] N78-30798
Genetics of microorganisms and medicine
N78-31698

MICROPROCESSORS
Variability of oxygen affinity of normal blood - An automated method of measurement
A78-47209

MICROWAVES
Study of the specific effects of microwaves on the central nervous system. I - Demonstration of modifications of cerebral electrogenesis in the rat
A78-46953

MILITARY AVIATION
Longevity in military pilots - 37-year followup of the Navy's '1000 Aviators'
A78-48087

MILITARY HELICOPTERS
Methodological considerations of visual workloads of helicopter pilots --- eye movement measurements
N78-31747

MILITARY OPERATIONS
Mathematical analysis and computer simulation in military mission workload assessment
N78-31758
MINERAL METABOLISM
Changes of closely related enzymes and minerals to neuro-muscular systems of albino rats, during prolonged exposure to simulated hypogravics
A78-48645
MITOSIS
Effect of gravity on lymphocyte activation
A78-48604
Proliferation of bone marrow cells under the influence of superhigh intensity steady magnetic fields
N78-31707
MODELS
Operator workload assessment model: An evaluation of a VF/VA-V/STOL system
N78-31757
MOLECULAR BIOLOGY
A measure of the denseness of a phylogenetic network --- by sequenced proteins from extant species
A78-47890
Archaebacteria --- biology and chemistry
A78-47891
Phytanyl-glycerol ethers and squalenes in the archaebacterium Methanobacterium thermoautotrophicum
A78-47892
MORTALITY
Longevity in military pilots - 37-year followup of the Navy's "1000 Aviators"
A78-48087
MOTION PERCEPTION
Comparison of the visual perception of a runway model in pilots and nonpilots during simulated night landing approaches
A78-48076
Two factors in the perception of velocity at a distance
A78-48823
Subjective motion and acceleration induced by the movement of the observer's entire visual field
A78-48824
MOUNTAIN INHABITANTS
Retinal hemorrhage in high mountain climbers
A78-47113
MRCA AIRCRAFT
NGL advances --- valveless LOX converter for Tornado aircraft
A78-50085
MUSCLES
Biochemical adaptations of antigravity muscle fibers to disuse atrophy
[NASA-CR-151822] N78-30796
MUSCULAR FATIGUE
Influence of posture on isometric fatigue
A78-47207
MUSCULAR FUNCTION
Emotional state and orthostatic reactions
A78-47960
Movements of the eyes --- Book
A78-48506
MUSCULAR TONUS
The microvibrations of the body, an index for examination stress
A78-49297
MUSCULOSKELETAL SYSTEM
A general myocybernetic control model of skeletal muscle
[CSIR-SR-WISK-280] N78-30809
MUTATIONS
Neutral changes during divergent evolution of hemoglobins
A78-47893
Late biological effects of ionizing radiation as influenced by dose, dose rate, age at exposure, and genetic sensitivity to neoplastic transformation
[LA-UR-78-681] N78-31724
MYOCARDIUM
Substrate effects on myocardial performance during normoxia and hypoxia
A78-47949
Analysis of the contractility of the myocardium of different heart chambers by means of comparing the isometric contraction of isolated stria and the strain-gage recording of isometric stress of the myocardium of an intact functioning heart
A78-48753
Mathematical model of the contractile activity and the chronoinotropism of the myocardium
A78-48755
Investigation of the output of the left ventricle of the human heart
A78-48756

N

NAVY
US Navy fleet aviation training program development
[AD-A055788] N78-31734
NEOPLASMS
Late biological effects of ionizing radiation as influenced by dose, dose rate, age at exposure, and genetic sensitivity to neoplastic transformation
[LA-UR-78-681] N78-31724
NERVOUS SYSTEM
Dependence of the reaction of the human nervous system on the distribution of absorbed doses of ionizing radiation
N78-31704
NEUROMUSCULAR TRANSMISSION
Changes of closely related enzymes and minerals to neuro-muscular systems of albino rats, during prolonged exposure to simulated hypogravics
A78-48645
NEUROPHYSIOLOGY
State of hypothalamo-hypophyseal neurosecretory system during hyperbaric oxygenation
A78-49700
NEUROSES
Interrelation of psychosomatic troubles and psychoneurotic troubles in aeronautics
A78-46958
NIGHT VISION
Comparison of the visual perception of a runway model in pilots and nonpilots during simulated night landing approaches
A78-48076
Correlations between night vision tests
[FOA-C-56014-H9] N78-31726
NITROGEN OXIDES
Nitrogen oxides: Current status of knowledge
[EPRI-EA-668] N78-31723
NITROSAMINE
Nitrosamines
[PB-280479/7] N78-31727
NITROUS OXIDES
An assessment of a N2O rebreathing method for the estimation of cardiac output during severe exercise
A78-47492
NOISE INTENSITY
Effects of noise and hearing acuity upon visual depth perception and safety among humans
[PB-280365/8] N78-30812
NOISE POLLUTION
Federal noise research in noise effects
[PB-280335/1] N78-31733
NOISE REDUCTION
Application of commercially available filter components for psychoacoustic testing
A78-49898
NUCLEAR RADIATION
ORIS: The Oak Ridge Imaging System program listings
[ORNL-TM-5875-V3] N78-31722
NUCLEOTIDES
Genetic code correlations - Amino acids and their anticodon nucleotides
A78-47888
The genetic code as a periodic table
A78-47889
Neutral changes during divergent evolution of hemoglobins
A78-47893
Studies on adenine acid-soluble nucleotides content in the liver of gamma-irradiated chicken embryos
A78-48442

NUTATION
Simulation of circumnutations - Behaviour under different g's --- of plants
A78-48688

NUTRITION
Nitrosamines
[PB-280479/7] N78-31727

O

OCEAN SURFACE
Psychophysiological characteristics of pilot activity during low-altitude flights over the sea
A78-48410

OCULAR CIRCULATION
Susceptibility of the cat's visual system to hypoxia, hypotonia and circulatory arrest
A78-49300

OCULOGRAVIC ILLUSIONS
Effects of partial body weightlessness on the vestibulo-ocular reflex in man
A78-47112

OCULOMETERS
Choice and analytic techniques involving indices of visual information input. I
A78-46954
An experimental investigation of the effect of 1.06 micrometers laser light on the transparent ocular media
[AD-A055650] N78-31719

OPERATOR PERFORMANCE
Information processing under emotionally saturated conditions of activity
A78-47957
Operator activity in a state of continuous wakefulness
A78-47969
Visual work capacity under the action of overloads and elevated temperature
A78-47972
Visual work capacity of an operator
A78-47985
Effect of spectral filtering during continuous two-day work
A78-47986
Realignments of the cardiovascular system of a human operator under the action of negative gravity
A78-48760
Describing the human operator's internal model of a dynamic system
A78-49273
The human operator simulator: Workload estimation using a simulated secondary task
N78-31756

OPHTHALMOLOGY
Retinal hemorrhage in high mountain climbers
A78-47113

OPTICAL FILTERS
Effect of spectral filtering during continuous two-day work
A78-47986

OPTICAL TRACKING
Head rotational spectral characteristics during two-dimensional smooth pursuit tasks
A78-49263

OPTIMIZATION
Use of eye-movement measures to establish design parameters for helicopter instrument panels
N78-31748

ORBITAL FLIGHT TESTS (SHUTTLE)
Urine monitoring system failure analysis and operational verification test report
[NASA-CR-151828] N78-30820

ORGANIC LIQUIDS
Hazards of organic working fluids
[BNL-50761] N78-31725

ORTHOSTATIC TOLERANCE
Influence of posture on isometric fatigue
A78-47207
Emotional state and orthostatic reactions
A78-47960
Realignments of the cardiovascular system of a human operator under the action of negative gravity
A78-48760

OSCILLATIONS
The microvibrations of the body, an index for examination stress
A78-49297

OSMOSIS
Calcium transport in Halobacterium halobium envelope vesicles
A78-48574

OTOLITH ORGANS
Mechanisms of interaction between receptors of the vestibular system --- Russian book
A78-48522

OXYGEN BREATHING
Molecular sieve generation of aviator's oxygen: Breathing gas composition as a function of flow, inlet pressure, and cabin altitude
[AD-A054240] N78-30822

OXYGEN CONSUMPTION
Variability of oxygen affinity of normal blood - An automated method of measurement
A78-47209
Substrate effects on myocardial performance during normoxia and hypoxia
A78-47949

OXYGEN METABOLISM
The evolution of the earliest cells
A78-47846
Analysis of energy metabolism of a functioning heart during hypoxia and variations of functional loading
A78-48754
The effect of high altitude on pyridine nucleotides and adenosine phosphates in the liver of the rat
N78-31689

OXYGEN REGULATORS
NGL advances --- valveless LOX converter for Tornado aircraft
A78-50085

OXYGEN SUPPLY EQUIPMENT
NGL advances --- valveless LOX converter for Tornado aircraft
A78-50085
An evaluation of the fluidic oxygen partial pressure sensor
[AD-A055362] N78-31743

P

PALEOBIOLOGY
The evolution of the earliest cells
A78-47846
Archaebacteria --- biology and chemistry
A78-47891

PANELS
Use of eye-movement measures to establish design parameters for helicopter instrument panels
N78-31748

PARACHUTE DESCENT
Information processing under emotionally saturated conditions of activity
A78-47957

PARTICLE EMISSION
Design and construction of the Donner 280-crystal positron ring for dynamic transverse section emission imaging
[LBL-5679] N78-31721

PASSENGERS
The vibrating environment in transport vehicles: A critical bibliographical study --- human tolerance to vibratory loads
[RAE-LIB-TRANS-1917] N78-31738

PATHOLOGICAL EFFECTS
Air quality criteria for lead
[PB-280411/0] N78-31730

PERFORMANCE PREDICTION
Pilot training and prognosis of psychophysiological conditioning of astronauts
A78-47955
Residual attention as a predictor of pilot performance
A78-49274
Predicting the effects of dual-frequency vertical vibration on continuous manual control performance
A78-50081

PERFORMANCE TESTS
Radio telegraphy as a realistic test for investigating an astronaut's activity
A78-47964

Residual attention as a predictor of pilot performance
A78-49274
A pilot evaluation of two G-seat cueing schemes [NASA-TP-1255]
N78-31739
PERSONALITY
Suggestibility and characterological features of personality
A78-47961
PERSONNEL SELECTION
Suggestibility and characterological features of personality
A78-47961
PH
CSF pH and ventilatory acclimatization to altitude --- cerebrospinal fluid
A78-47208
PHARMACOLOGY
Serotonin involvement in pituitary-adrenal function
A78-48575
PHOTOCHEMICAL REACTIONS
Illumination-dependent changes in the intrinsic fluorescence of bacteriorhodopsin
A78-48578
PHOTOGRAPHY
An experimental investigation of the effect of 1.06 microcmeters laser light on the transparent ocular media [AD-A055650]
N78-31719
PHOTOPRODUCTION
A special photoproduct in DNA, UV-irradiated in vacuo
A78-48623
PHOTOSYNTHESIS
Effects of simulated hypogravity on respiration and photosynthesis of higher plants
A78-48680
PHYSICAL EXAMINATIONS
The microvibrations of the body, an index for examination stress
A78-49297
PHYSICAL EXERCISE
Adaptive cardiovascular changes to physical training in spontaneously hypertensive and normotensive rats
A78-46981
Influence of posture on isometric fatigue
A78-47207
An assessment of a N2O rebreathing method for the estimation of cardiac output during severe exercise
A78-47492
Hormonal responses of sedentary and exercising men to recurrent heat exposure
A78-48084
PHYSICAL WORK
Performance, mood, and clinical symptoms in men exposed to prolonged, severe physical work and sleep deprivation
A78-48079
PHYSIOLOGICAL EFFECTS
Man under conditions of weightlessness --- physiolcgical effects
A78-47482
Biological significance of some metals as air pollutants. Part 2: Mercury [PB-279670/4]
N78-30814
Translaticns on USSR science and technology: Biomedical and behavioral sciences, no. 40. Effects or nonionizing electromagnetic radiation [JPRS-71595]
N78-31705
Work Capability and physiological effects Predictive studies. 4: in HE-02 excursions to pressures of 400-800-1200- and 1600 feet of sea water [NASA-CR-157571]
N78-31714
The vibrating environment in transport vehicles: A critical biblicgraphical study --- human tolerance to vibratory loads [RAE-LIB-TRANS-1917]
N78-31738
PHYSIOLOGICAL FACTORS
Behavior therapy and the treatment of flight phobia
A78-48086
PHYSIOLOGICAL RESPONSES
Hormonal responses of sedentary and exercising men to recurrent heat exposure
A78-48084
Loss of circadian rhythmicity in body temperature and locomotor activity following suprachiasmatic lesions in the rat
A78-48576
Responses of roots to simulated weightlessness on the fast rotating klinostat
A78-48667
Gravity as a biochemical determinant
A78-48671
Systems analysis of sympathetic functions
A78-48752
Analysis of energy metabolism of a functioning heart during hypoxia and variations of functional loading
A78-48754
Physiological response to atmospheric pollutants [PB-280413/6]
N78-31731
Physiological measures of workloads: Correlations between physiological parameters and operational performance
N78-31753
PHYSIOLOGICAL TESTS
Justification of the use of artificial gravity in space flight --- for optimal astronaut performance
A78-47959
Operator activity in a state of continuous wakefulness
A78-47969
Human operator in a spacecraft control system during descent in the atmosphere
A78-47970
Manual control of astronaut attitude with a three-stage setup
A78-47971
Visual work capacity under the action of overloads and elevated temperature
A78-47972
Spaceflight stress factors and the ability to track
A78-47973
Analysis of the contractility of the myocardium of different heart chambers by means of comparing the isometric contraction of isolated stria and the strain-gage recording of isometric stress of the myocardium of an intact functioning heart
A78-48753
Investigation of the output of the left ventricle of the human heart
A78-48756
Correlations between night vision tests [FOA-C-56014-H9]
N78-31726
PIGMENTS
Spectrophotofluorometric and electron microscopic study of Lipofuscin accumulation in the testis of aging mice
A78-48581
Microorganisms of the upper layers of the atmosphere and protective role of their cell pigments
A78-48712
PILOT ERROR
Spatial disorientation in general aviation accidents
A78-48081
PILOT PERFORMANCE
Deterioration of human performance resulting from mechanical vibrations
A78-46955
Crises of maladaptation in confirmed pilots
A78-46959
Method of evaluating the work capacity of pilots and astronauts
A78-47962
Psychophysiological characteristics of pilot activity during low-altitude flights over the sea
A78-48410
Residual attention as a predictor of pilot performance
A78-49274
A reaction time analysis of instrument scanning --- by aircraft pilots
A78-49275
Simulator study for the determination of the demands upon the pilot in the case of unconventional, spatially curved approach profiles --- German thesis
A78-49406
Visual workload of the copilot/navigator during terrain flight [AD-A055038]
N78-31742

Methods to assess work load
[AGARD-CP-216] N78-31745
Methodological considerations of visual workloads of helicopter pilots --- eye movement measurements N78-31747
Use of eye-movement measures to establish design parameters for helicopter instrument panels N78-31748
Auditory communication and workload --- human response time measurements to voice communication N78-31749
Pitch and formant analysis of the voice in the investigation of pilot workshop N78-31750
Use of Inspiratory Minute Volumes in evaluation of rotary and fixed wing pilot workload --- respiratory response to flight conditions N78-31754

PILOT TRAINING
Task-specific simulator pretraining and in-flight stress of student pilots A78-48085

PITCH (INCLINATION)
The effect of rotational vibration in roll and pitch axes on the discomfort of seated subjects A78-50080

PITUITARY GLAND
Serotonin involvement in pituitary-adrenal function A78-48575

PLANETARY COMPOSITION
Volcanism and soil mercury on Mars - Consequences for terrestrial microorganisms A78-48670

PLANETARY ENVIRONMENTS
Growth of fungi in NaCl-MgSO4 brines A78-48653

PLANKTON
Distribution of phytoplankton in Tennessee lakes
[PB-280139/7] N78-30803
Distribution of phytoplankton in Ohio lakes
[PB-280140/5] N78-30804

PLANT ROOTS
Responses of roots to simulated weightlessness on the fast rotating klinostat A78-48667

PLANTS (BOTANY)
Effects of simulated hypogravity on respiration and photosynthesis of higher plants A78-48680
Simulation of circumnutations - Behaviour under different g's --- of plants A78-48684
Is gravity a morphological determinant in plants at the cellular level A78-48699

PLETHYSMOGRAPHY
Electric impedance and mechanical recording, cardiovascular investigative methods in air medicine A78-46951

PORTABLE EQUIPMENT
A variant of portable single-channel bioradictelemetry system N78-31702

POSITRONS
Design and construction of the Donner 280-crystal positron ring for dynamic transverse section emission imaging
[LBL-5679] N78-31721

POSTFLIGHT ANALYSIS
Peculiar characteristics of crewmembers' metabolism on the second expedition aboard orbital station Salyut-4 A78-48080

POSTURE
Influence of posture on isometric fatigue A78-47207

POTASSIUM
Changes of closely related enzymes and minerals to neuro-muscular systems of albino rats, during prolonged exposure to simulated hypogravics A78-48645
Measurements of potassium changes in the cat carotid body under hypoxia and hypercapnia A78-49299

POWER LINES
Possibility of attenuating the ecological effects of alternating current power lines as a result of new designs and circuit changes N78-31708

PRECAMBRIAN PERIOD
The evolution of the earliest cells A78-47846

PRESSURE SENSORS
An evaluation of the fluidic oxygen partial pressure sensor
[AD-A055362] N78-31743

PROGRAMS
US Navy fleet aviation training program development
[AD-A055788] N78-31734

PROJECT MANAGEMENT
SMD 3 post test medical report
[NASA-TM-79750] N78-30799

PROTECTIVE CLOTHING
Metabolic and thermal responses of men wearing cold-protective clothing to various degrees of cold stress A78-49298
Study of reactive materials for development of new protective clothing concepts
[AD-A054877] N78-30826

PROTEINS
A measure of the denseness of a phylogenetic network --- by sequenced proteins from extant species A78-47890
The 70 S monosome accumulation and in vitro initiation complex formation by Escherichia coli ribosomes at 5 C
[NASA-CR-157591] N78-31691

PSYCHIATRY
Interrelation of psychosomatic troubles and psychoneurotic troubles in aeronautics A78-46958

PSYCHOACOUSTICS
Application of commercially available filter components for psychoacoustic testing A78-49898

PSYCHOLOGICAL EFFECTS
Sensory deprivation as a problem of prolonged space flights A78-47484
Information processing under emotionally saturated conditions of activity A78-47957
Suggestibility and characterological features of personality A78-47961

PSYCHOLOGICAL FACTORS
Psychological state of the operator and visual evaluation of lunar relief A78-47988

PSYCHOLOGY
Crises of maladaptation in confirmed pilots A78-46959

PSYCHOMOTOR PERFORMANCE
Deterioration of human performance resulting from mechanical vibrations A78-46955
Method of investigating perceptual extrapolation A78-47963
Radio telegraphy as a realistic test for investigating an astronaut's activity A78-47964

PSYCHOPHYSICS
Subjective motion and acceleration induced by the movement of the observer's entire visual field A78-48824
The psychophysical tuning curve: A parametric study N78-30807

PSYCHOPHYSIOLOGY
Adaptational fluctuations in the initial state of space flight --- astronaut performance A78-47953
Pilot training and prognosis of psychophysiological conditioning of astronauts A78-47955
Psychological model of weightlessness in space flight simulation A78-47958
Emotional state and orthostatic reactions A78-47960
Radio telegraphy as a realistic test for investigating an astronaut's activity A78-47964

Psychophysiological characteristics of pilot activity during low-altitude flights over the sea
A78-48410

PSYCHOSOMATICS
Interrelation of psychosomatic troubles and psychoneurotic troubles in aeronautics
A78-46958

PUBLIC HEALTH
Biological significance of some metals as air pollutants. Part 2: Mercury
[PB-279670/4] N78-30814
Nitrosamines
[PB-280479/7] N78-31727
Federal noise research in noise effects
[PB-280335/1] N78-31733

PULMONARY FUNCTIONS
Altitude tolerance of general aviation pilots with normal or partially impaired spirometric function
A78-48088

PURSUIT TRACKING
Method of evaluating the work capacity of pilots and astronauts
A78-47962
Head rotational spectral characteristics during two-dimensional smooth pursuit tasks
A78-49263
Physiological measures of workloads: Correlations between physiological parameters and operational performance
N78-31753

PYRIDINE NUCLEOTIDES
The effect of high altitude on pyridine nucleotides and adenosine phosphates in the liver of the rat
N78-31689

Q

QUALITY CONTROL
Perceived magnitudes of distortion, secondary imaging, and rainbowing in aircraft windshields
A78-49272

R

RADAR NAVIGATION
Objective workload and behavioural response in airport radar control rooms
A78-47491

RADIATION DAMAGE
Studies on adenine acid-soluble nucleotides content in the liver of gamma-irradiated chicken embryos
A78-48442

RADIATION DOSAGE
Concorde and cosmic rays
A78-46952
Dependence of the reaction of the human nervous system on the distribution of absorbed doses of ionizing radiation
N78-31704
Late biological effects of ionizing radiation as influenced by dose, dose rate, age at exposure, and genetic sensitivity to neoplastic transformation
[LA-UR-78-681] N78-31724

RADIATION EFFECTS
Study of the specific effects of microwaves on the central nervous system. I - Demonstration of modifications of cerebral electrogenesis in the rat
A78-46953
The action of space flight factors on radiation effects of additional gamma-irradiation of seeds
A78-48611
Biological investigations on the orbital station 'Salyut-5'
A78-48679
Genetic effects of cosmic radiation on bacteriophage T4Br/+/ - On materials of biological experiment 'Soyuz-Apollo'
A78-48682
Translations on USSR science and technology: Biomedical and behavioral sciences, no. 40. Effects on nonionizing electromagnetic radiation
[JPRS-71595] N78-31705

RADIATION PROTECTION
Microorganisms of the upper layers of the atmosphere and protective role of their cell pigments
A78-48712

RADIATIVE HEAT TRANSFER
Instrumentation for the measurement of the evaporative and radiative heat loss rates from man in a normal working mode
N78-30819

RADIO TELEGRAPHY
Radio telegraphy as a realistic test for investigating an astronaut's activity
A78-47964

RADIOACTIVE WASTES
Disposal of radioactive iodine in space
[NASA-TP-1313] N78-31740

RADIOBIOLOGY
Dosimetric and biological results from the Bacillus subtilis Biostack experiment within the ASTP
A78-48598
The action of space flight factors on radiation effects of additional gamma-irradiation of seeds
A78-48611

RADIOLOGY
ORIS: The Oak Ridge Imaging System program listings
[ORNL-TM-5875-V3] N78-31722

RATS
The effect of high altitude on pyridine nucleotides and adenosine phosphates in the liver of the rat
N78-31689

REACTION TIME
Effect of spectral filtering during continuous two-day work
A78-47986
A reaction time analysis of instrument scanning --- by aircraft pilots
A78-49275
Auditory communication and workload --- human response time measurements to voice communication
N78-31749

REBREATHING
An assessment of a N2O rebreathing method for the estimation of cardiac output during severe exercise
A78-47492

RECEPTORS (PHYSIOLOGY)
Translations on USSR science and technology: Biomedical and behavioral sciences, no. 35
[JPRS-71467] N78-31694
Electroreceptors in man and other animals
N78-31696

RECONNAISSANCE
Results of visual observations of the atmosphere and landscapes from manned spacecraft
A78-47989

REMOTE CONTROL
Manual control of astronaut attitude with a three-stage setup
A78-47971
Dynamic decoupling of a remote manipulator system
A78-49257

REMOTE HANDLING
Analog simulation of the movements of an ideal manipulator
A78-48511
A comparison of control modes for time delayed remote manipulation
N78-31737

REMOTELY PILOTED VEHICLES
Effectiveness of basic display augmentation in vehicular control by visual field cues
A78-49262

REPRODUCTIVE SYSTEMS
Hypergravity - Its effect on the estrous cycle and hormonal levels in female rats
A78-48722

RESINS
A literature review: Problem definition studies on selected toxic chemicals. Volume 6: Occupational health and safety and environmental aspects of urea-formaldehyde resins
[AD-A054991] N78-31716

RESPIRATORS
The artificial gill: A study of its development, theory of operation, humanistic aspects, and design
N78-30805

RESPIRATORY DISEASES
Elasticity of excised dog lung parenchyma
A78-47206

RESPIRATORY PHYSIOLOGY
Effect of atropine upon the cerebrovascular system during GD-induced respiratory depression
[AD-A054807] N78-30811
Physiological response to atmospheric pollutants
[PB-280413/6] N78-31731

RESPIRATORY RATE
Altitude tolerance of general aviation pilots with normal or partially impaired spirometric function
A78-48088
Effects of simulated hypogravity on respiration and photosynthesis of higher plants
A78-48680
Preliminary analysis of available inflight respiratory data
[AD-A054241] N78-30823
Use of Inspiratory Minute Volumes in evaluation of rotary and fixed wing pilot workload --- respiratory response to flight conditions
N78-31754

RESPIRATORY SYSTEM
Factors determining maximal expiratory flows in the human lung
N78-31711

RETINA
Retinal hemorrhage in high mountain climbers
A78-47113

RHYTHM (BIOLOGY)
Medical problems of rationalizing the work-rest regimen of astronauts
A78-47956
Evolution of sleep: Stages of formation of the wakefulness-sleep cycle in a number of vertebrates --- Russian book
A78-48524

RIDING QUALITY
Vibration aspects of ride quality modeling for the DOT TTACV: Theory and experiment
[PB-279846/0] N78-31744

ROBOTS
Manipulators: Dynamics and algorithms --- Russian book
A78-48529

ROLL
The effect of rotational vibration in roll and pitch axes on the discomfort of seated subjects
A78-50080

ROTATING BODIES
Subjective motion and acceleration induced by the movement of the observer's entire visual field
A78-48824

ROTATING DISKS
Responses of roots to simulated weightlessness on the fast rotating klinostat
A78-48667

ROTATING ENVIRONMENTS
The effect of rotational vibration in roll and pitch axes on the discomfort of seated subjects
A78-50080

RUNWAY LIGHTS
Comparison of the visual perception of a runway model in pilots and nonpilots during simulated night landing approaches
A78-48076

S

SALINITY
Growth of fungi in NaCl-MgSO4 brines
A78-48653

SALYUT SPACE STATION
Peculiar characteristics of crewmembers' metabolism on the second expedition aboard orbital station Salyut-4
A78-48080
Biological investigations on the orbital station 'Salyut-5'
A78-48679

SCANNING
A reaction time analysis of instrument scanning --- by aircraft pilots
A78-49275

SEA WATER
Work Capability and physiological effects Predictive studies. 4: in HE-02 excursions to pressures of 400-800-1200- and 1600 feet of sea water
[NASA-CR-157571] N78-31714

SEATS
A seat cushion to provide realistic acceleration cues for aircraft simulator pilots
[NASA-CASE-LAR-12149-2] N78-30821

SECRETIONS
State of hypothalamo-hypophyseal neurosecretory system during hyperbaric oxygenation
A78-49700

SEEDS
The action of space flight factors on radiation effects of additional gamma-irradiation of seeds
A78-48611

SEMICIRCULAR CANALS
Mechanisms of interaction between receptors of the vestibular system --- Russian book
A78-48522

SENSORIMOTOR PERFORMANCE
Spaceflight stress factors and the ability to track
A78-47973
Visual-motor coordination in the simulation of 10-day reduced gravity
A78-47976
Mechanisms of self-regulation of the functional system of tracking in normal and pathological states
A78-47979
Visual work capacity of an operator
A78-47985
Residual attention as a predictor of pilot performance
A78-49274

SENSORY PERCEPTION
Method of investigating perceptual extrapolation
A78-47963

SEROTONIN
Serotonin involvement in pituitary-adrenal function
A78-48575

SERVOCONTROL
Control of a flexible manipulator arm
A78-47541
A comparison of control modes for time delayed remote manipulation
N78-31737

SEWAGE TREATMENT
Biochemical oxygen demand, volume 2. A bibliography with abstracts
[NTIS/PS-78/0574/0] N78-30801
Biochemical oxygen demand, volume 3. A bibliography with abstracts
[NTIS/PS-78/0575/7] N78-30802

SITTING POSITION
The effect of rotational vibration in roll and pitch axes on the discomfort of seated subjects
A78-50080

SKIN (ANATOMY)
Laser-induced thermal damage of skin
[AD-A054612] N78-30810

SKIN TEMPERATURE (BIOLOGY)
Convergence of skin and rectal temperatures as a criterion for heat tolerance
A78-48083

SLEEP
Evolution of sleep: Stages of formation of the wakefulness-sleep cycle in a number of vertebrates --- Russian book
A78-48524
Instruments and methodology for the assessment of physiological cost of performance of stressful continuous operations: The air traffic services tower environment
N78-31752

SLEEP DEPRIVATION
Operator activity in a state of continuous wakefulness
A78-47969
Performance, mood, and clinical symptoms in men exposed to prolonged, severe physical work and sleep deprivation
A78-48079

SOILS
Volcanism and soil mercury on Mars - Consequences for terrestrial microorganisms
A78-48670
SPACE ENVIRONMENT SIMULATION
Operator activity in a state of continuous wakefulness
A78-47969
Human operator in a spacecraft control system during descent in the atmosphere
A78-47970
Manual control of astronaut attitude with a three-stage setup
A78-47971
Spaceflight stress factors and the ability to track
A78-47973
Visual-motor coordination in the simulation of 10-day reduced gravity
A78-47976
Bioenergetics of control in the state of simulated weightlessness
A78-47980
A special photoproduct in DNA, UV-irradiated in vacuo
A78-48623
SPACE FLIGHT STRESS
Sensory deprivation as a problem of prolonged space flights
A78-47484
Characteristics of cosmonaut activities during flight --- Russian book
A78-47951
Adaptational fluctuations in the initial state of space flight --- astronaut performance
A78-47953
Medical problems of rationalizing the work-rest regimen of astronauts
A78-47956
Justification of the use of artificial gravity in space flight --- for optimal astronaut performance
A78-47959
Method of investigating perceptual extrapolation
A78-47963
Radio telegraphy as a realistic test for investigating an astronaut's activity
A78-47964
Spaceflight stress factors and the ability to track
A78-47973
Peculiar characteristics of crewmembers' metabolism on the second expedition aboard orbital station Salyut-4
A78-48080
The action of space flight factors on radiation effects of additional gamma-irradiation of seeds
A78-48611
Biological investigations on the ortital station 'Salyut-5'
A78-48679
SPACE FLIGHT TRAINING
Pilot training and prognosis of psychophysiological conditioning of astronauts
A78-47955
Psychological model of weightlessness in space flight simulation
A78-47958
SPACE NAVIGATION
The astronaut in the astronavigation system of manned spacecraft
A78-47968
SPACE ORIENTATION
Hornet building orientation in a vertically rotating centrifuge
A78-48713
SPACE PERCEPTION
Some aspects of depth perception in space
A78-47981
Psychological state of the operator and visual evaluation of lunar relief
A78-47988
SPACE SIMULATORS
Continuous metabolic and cardiovascular measurements on a monkey subject during a simulated 6-day Spacelab mission
A78-48719
SPACE STATIONS
Microbiological study of bioecological system. I --- for Spacelab
A78-47111
SPACE SUITS
Translations on USSR science and technology: Biomedical and behavioral sciences, no. 35 [JPRS-71467]
N78-31694
Evolution of the space suit
N78-31695
Spacesuit mobility joints [NASA-CASE-ARC-11058-1]
N78-31735
Spacesuit torso closure [NASA-CASE-ARC-11100-1]
N78-31736
SPACE TRANSPORTATION SYSTEM
Disposal of radioactive iodine in space [NASA-TP-1313]
N78-31740
SPACEBORNE EXPERIMENTS
Is gravity a morphological determinant in plants at the cellular level
A78-48699
SPACECRAFT CONTROL
Human operator in a spacecraft control system during descent in the atmosphere
A78-47970
Manual control of astronaut attitude with a three-stage setup
A78-47971
Adaptive systems of spacecraft control
A78-47975
SPACECREWS
Suggestibility and characterological features of personality
A78-47961
Peculiar characteristics of crewmembers' metabolism on the second expedition aboard orbital station Salyut-4
A78-48080
SMD 3 post test medical report [NASA-TM-79750]
N78-30799
SPACELAB
Microbiological study of bioecological system. I --- for Spacelab
A78-47111
Continuous metabolic and cardiovascular measurements on a monkey subject during a simulated 6-day Spacelab mission
A78-48719
SMD 3 post test medical report [NASA-TM-79750]
N78-30799
SPECIES DIFFUSION
A measure of the denseness of a phylogenetic network --- by sequenced proteins from extant species
A78-47890
STANDARDS
Air quality criteria for lead [PB-280411/0]
N78-31730
STATISTICAL ANALYSIS
Longevity in military pilots - 37-year followup of the Navy's '1000 Aviators'
A78-48087
STRESS (PHYSIOLOGY)
Elasticity of excised dog lung parenchyma
A78-47206
The microvibrations of the body, an index for examination stress
A78-49297
Regulation of the adrenal cortex function during stress [NASA-CR-157397]
N78-30808
Hypothermia. A bibliography with abstracts [NTIS/PS-78/0517/9]
N78-30816
Instruments and methodology for the assessment of physiological cost of performance of stressful continuous operations: The air traffic services tower environment
N78-31752
STRESS (PSYCHOLOGY)
Sensory deprivation as a problem of prolonged space flights
A78-47484
Objective workload and behavioural response in airport radar control rooms
A78-47491
STRESS-STRAIN RELATIONSHIPS
Elasticity of excised dog lung parenchyma
A78-47206
STRUCTURAL VIBRATION
Deterioration of human performance resulting from mechanical vibrations
A78-46955

SUSPENSION SYSTEMS (VEHICLES)
Vibration aspects of ride quality modeling for the DOT PTACV: Theory and experiment
[PB-279846/0] N78-31744
SYSTEMS ANALYSIS
Diagnostic improvements in medical ultrasonic imaging systems
N78-31710
SYSTEMS ENGINEERING
Technology requirements for non-terrestrial ecosystems
A78-48666

T

TAPE RECORDERS
Is man the weakest link? --- real time activity recording of aircrew workloads
N78-31746
TARGET ACQUISITION
Display size and target acquisition performance
[AD-A054624] N78-31741
TASK COMPLEXITY
Processes of learning complex behavior
A78-49801
Determination of stress and strain of air traffic control officers --- physiological response measurements
N78-31751
TECHNOLOGY ASSESSMENT
Technology requirements for non-terrestrial ecosystems
A78-48666
Nitrogen oxides: Current status of knowledge
[EPRI-EA-668] N78-31723
TEMPERATURE EFFECTS
The 70 S monosome accumulation and in vitro initiation complex formation by Escherichia coli ribosomes at 5 C
[NASA-CR-157591] N78-31691
TEMPERATURE MEASURING INSTRUMENTS
Instrumentation for the measurement of the evaporative and radiative heat loss rates from man in a normal working mode
N78-30819
A method of recording heat parameters of divers during work
N78-31703
TENNESSEE
Distribution of phytoplankton in Tennessee lakes
[PB-280139/7] N78-30803
TERPENES
Phytanyl-glycerol ethers and squalenes in the archaebacterium Methanobacterium thermoautotrophicus
A78-47892
TERRAIN FOLLOWING AIRCRAFT
Visual workload of the copilot/navigator during terrain flight
[AD-A055036] N78-31742
TEST EQUIPMENT
Application of commercially available filter components for psychoacoustic testing
A78-49898
TEST PILOTS
A pilot evaluation of two G-seat cueing schemes
[NASA-TP-1255] N78-31739
TESTES
Spectrophotofluorometric and electron microscopic study of lipofuscin accumulation in the testis of aging mice
A78-48581
TEXTILES
Strong sensitizers
[PB-280475/5] N78-31728
THERAPY
Behavior therapy and the treatment of flight phobia
A78-48086
Electrical enhancement of healing in combat injuries to hard and soft tissues
[AD-A055531] N78-31718
THERMAL COMFORT
Metabolic and thermal responses of men wearing cold-protective clothing to various degrees of cold stress
A78-49298

THERMOREGULATION
Metabolic and thermal responses of men wearing cold-protective clothing to various degrees of cold stress
A78-49298
Effect of altered gravity on temperature regulation in mammals: Investigation of gravity effect on temperature regulation in mammals
[NASA-CR-157570] N78-30797
TIME LAG
A comparison of control modes for time delayed remote manipulation
N78-31737
TIME SERIES ANALYSIS
Biochemical adaptations of antigravity muscle fibers to disuse atrophy
[NASA-CR-151822] N78-30796
TISSUES (BIOLOGY)
Hypoxia tolerance in rats in relation to tissue glycogen levels
A78-48078
TOMOGRAPHY
Digital enhancement of computerized axial tomograms
[NASA-TM-78974] N78-31690
TORSO
Spacesuit torso closure
[NASA-CASE-ARC-11100-1] N78-31736
TOXIC HAZARDS
Hazards of organic working fluids
[BMI-50761] N78-31725
Air quality criteria for lead
[PB-280411/0] N78-31730
Physiological response to atmospheric pollutants
[PB-280413/6] N78-31731
TOXICITY
Behavior, ecology and toxicity of venomous marine fishes
[AD-A054925] N78-31692
Toxicological evaluation of Pyrethrins Fogging Concentrate (trade name) study No. 51-1309-78
[AD-A055088] N78-31715
TOXICITY AND SAFETY HAZARD
A literature review: Problem definition studies on selected toxic chemicals. Volume 6: Occupational health and safety and environmental aspects of urea-formaldehyde resins
[AD-A054991] N78-31716
Nitrosamines
[PB-280479/7] N78-31727
Strong sensitizers
[PB-280475/5] N78-31728
TOXICOLOGY
Hypoxia survival variations in male and female mice as functions of chronological and environmental factors
A78-48082
Toxicology of metals, volume 3
[PB-280115/7] N78-30813
Toxicological evaluation of Pyrethrins Fogging Concentrate (trade name) study No. 51-1309-78
[AD-A055088] N78-31715
TRAINING SIMULATORS
Method of animal training for biosatellite
A78-47110
Task-specific simulator pretraining and in-flight stress of student pilots
A78-48085
TRANSMISSION CIRCUITS
Possibility of attenuating the ecological effects of alternating current power lines as a result of new designs and circuit changes
N78-31708
TRANSMISSION LINES
Possibility of attenuating the ecological effects of alternating current power lines as a result of new designs and circuit changes
N78-31708
TRANSPORT PROPERTIES
Calcium transport in Halobacterium halobium envelope vesicles
A78-48574
Methionine transport in Halobacterium halobium vesicles - Noncompetitive, asymmetric inhibition by L-Cysteine
A78-48579

TRANSPORT VEHICLES
The vibrating environment in transport vehicles: A critical bibliographical study --- human tolerance to vibratory loads
[RAE-LIB-TRANS-1917] N78-31738
TUNING
The psychophysical tuning curve: A parametric study
N78-30807
TURNING FLIGHT
Simulator study for the determination of the demands upon the pilot in the case of unconventional, spatially curved approach profiles --- German thesis
A78-49406

U

U.S.S.R.
Translations on USSR science and technology: Biomedical and behavioral sciences, no. 40. Effects on nonionizing electromagnetic radiation
[JPRS-71595] N78-31705
UH-1 HELICOPTER
Use of eye-movement measures to establish design parameters for helicopter instrument panels
N78-31748
ULTRAHIGH FREQUENCIES
Study of the specific effects of microwaves on the central nervous system. I - Demonstration of modifications of cerebral electrogenesis in the rat
A78-46953
ULTRASONIC WAVE TRANSDUCERS
Development and evaluation of an ultrasonic imaging system
[PB-279834/6] N78-31729
ULTRASONICS
Diagnostic improvements in medical ultrasonic imaging systems
N78-31710
ULTRAVIOLET RADIATION
A special photoproduct in DNA, UV-irradiated in vacuo
A78-48623
Microorganisms of the upper layers of the atmosphere and protective role of their cell pigments
A78-48712
URINE
Urine monitoring system failure analysis and operational verification test report
[NASA-CR-151828] N78-30820

V

V/STOL AIRCRAFT
Operator workload assessment model: An evaluation of a VF/VA-V/STOL system
N78-31757
VECTORCARDIOGRAPHY
Atrial flutter - Electrocardiographic, vectorcardiographic and echocardiographic correlation
A78-49150
VEHICULAR TRACKS
Vibration aspects of ride quality modeling for the DOT PTACV: Theory and experiment
[PB-279846/0] N78-31744
VELOCITY MEASUREMENT
Two factors in the perception of velocity at a distance
A78-48823
VERTEBRATES
Evolution of sleep: Stages of formation of the wakefulness-sleep cycle in a number of vertebrates --- Russian book
A78-48524
VERTICAL MOTION
Predicting the effects of dual-frequency vertical vibration on continuous manual control performance
A78-50081
VESTIBULAR NYSTAGMUS
Effects of partial body weightlessness on the vestibulo-ocular reflex in man
A78-47112
VESTIBULES
Mechanisms of interaction between receptors of the vestibular system --- Russian book
A78-48522

VIBRATION EFFECTS
Deterioration of human performance resulting from mechanical vibrations
A78-46955
The effect of rotational vibration in roll and pitch axes on the discomfort of seated subjects
A78-50080
Predicting the effects of dual-frequency vertical vibration on continuous manual control performance
A78-50081
Vibration aspects of ride quality modeling for the DOT PTACV: Theory and experiment
[PB-279846/0] N78-31744
VIBRATION PERCEPTION
The stability of equal sensation contours for whole-body vibration
A78-50082
VIBRATORY LOADS
The vibrating environment in transport vehicles: A critical bibliographical study --- human tolerance to vibratory loads
[RAE-LIB-TRANS-1917] N78-31738
VISUAL ACCOMMODATION
Visual evoked responses to the upper and lower half-field stimulation in a dark-adapted man
A78-50025
VISUAL ACUITY
Some aspects of depth perception in space
A78-47981
VISUAL CONTROL
Visual evaluation of simulated elements of lunar relief
A78-47987
Effectiveness of basic display augmentation in vehicular control by visual field cues
A78-49262
VISUAL DISCRIMINATION
The recognition of objects against a model of cosmic sky
A78-47983
Effect of spectral filtering during continuous two-day work
A78-47986
Visual evaluation of simulated elements of lunar relief
A78-47987
Psychological state of the operator and visual evaluation of lunar relief
A78-47988
Involuntary automatic processing in color-naming tasks
A78-48825
VISUAL FIELDS
Two factors in the perception of velocity at a distance
A78-48823
Subjective motion and acceleration induced by the movement of the observer's entire visual field
A78-48824
Effectiveness of basic display augmentation in vehicular control by visual field cues
A78-49262
A reaction time analysis of instrument scanning --- by aircraft pilots
A78-49275
Visual evoked responses to the upper and lower half-field stimulation in a dark-adapted man
A78-50025
VISUAL PERCEPTION
Visual work capacity under the action of overloads and elevated temperature
A78-47972
Ergonomic evaluation of cross-hair sights
A78-47982
Comparison of the visual perception of a runway model in pilots and nonpilots during simulated night landing approaches
A78-48076
Spatial disorientation in general aviation accidents
A78-48081
Two factors in the perception of velocity at a distance
A78-48823
Subjective motion and acceleration induced by the movement of the observer's entire visual field
A78-48824
Perceived magnitudes of distortion, secondary imaging, and rainbowing in aircraft windshields
A78-49272

Effects of noise and hearing acuity upon visual depth perception and safety among humans
[PB-280365/6] N78-30812
Bionics. A bibliography with abstracts
[NTIS/PS-78/0550/0] N78-31693
Contrast sensitivity of the human visual system at one luminance level while adapted to a stimulus at another luminance level
[AD-A055238] N78-31717

VISUAL PIGMENTS
Illumination-dependent changes in the intrinsic fluorescence of bacteriorhodopsin
A78-48578

VISUAL STIMULI
Effects of partial body weightlessness on the vestibulo-ocular reflex in man
A78-47112
Method of investigating perceptual extrapolation
A78-47963
Susceptibility of the cat's visual system to hypoxia, hypotonia and circulatory arrest
A78-49300
Visual evoked responses to the upper and lower half-field stimulation in a dark-adapted man
A78-50025

VISUAL TASKS
Choice and analytic techniques involving indices of visual information input. I
A78-46954
Detection of terrestrial landmarks during dark adaptation
A78-47984
Visual work capacity of an operator
A78-47985
Results of visual observations of the atmosphere and landscapes from manned spacecraft
A78-47989
Realignments of the cardiovascular system of a human operator under the action of negative gravity
A78-48760

VOICE COMMUNICATION
Pitch and formant analysis of the voice in the investigation of pilot workshop
N78-31750

VOLCANOLOGY
Volcanism and soil mercury on Mars - Consequences for terrestrial microorganisms
A78-48670

W

WAKEFULNESS
Evolution of sleep: Stages of formation of the wakefulness-sleep cycle in a number of vertebrates --- Russian book
A78-48528

WASTE DISPOSAL
Disposal of radioactive iodine in space
[NASA-TT-1513] N78-31740

WATER QUALITY
Distribution of phytoplankton in Tennessee lakes
[PB-280139/7] N78-30803
Distribution of phytoplankton in Ohio lakes
[PB-280140/5] N78-30804

WEIGHTLESSNESS
Effects of partial body weightlessness on the vestibulo-ocular reflex in man
A78-47112
Man under conditions of weightlessness --- physiological effects
A78-47482
Visual-motor coordination in the simulation of 10-day reduced gravity
A78-47976
Bioenergetics of control in the state of simulated weightlessness
A78-47980
Changes of closely related enzymes and minerals to neuro-muscular systems of albino rats, during prolonged exposure to simulated hypogravics
A78-48645
Is gravity a morphological determinant in plants at the cellular level
A78-48699
Effect of altered gravity on temperature regulation in mammals: Investigation of gravity effect or temperature regulation in mammals
[NASA-CR-157570] N78-30797

WEIGHTLESSNESS SIMULATION
Psychological model of weightlessness in space flight simulation
A78-47958
Responses of roots to simulated weightlessness on the fast rotating klinostat
A78-48667
Effects of simulated hypogravity on respiration and photosynthesis of higher plants
A78-48680

WINDSHIELDS
Perceived magnitudes of distortion, secondary imaging, and rainbowing in aircraft windshields
A78-49272

WORDS (LANGUAGE)
Involuntary automatic processing in color-naming tasks
A78-48825

WORK CAPACITY
Method of evaluating the work capacity of pilots and astronauts
A78-47962
Operator activity in a state of continuous wakefulness
A78-47969
Work Capability and physiological effects Predictive studies. 4: in HE-02 excursions to pressures of 400-800-1200- and 1600 feet of sea water
[NASA-CR-157571] N78-31714

WORK-REST CYCLE
Medical problems of rationalizing the work-rest regimen of astronauts
A78-47956

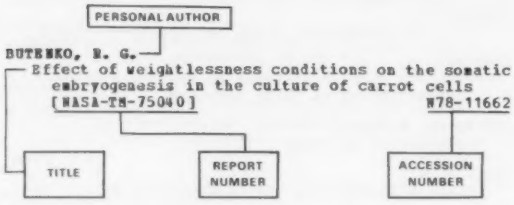
WORKING FLUIDS
Hazards of organic working fluids
[BWI-50761] N78-31725

WORKLOADS (PSYCHOPHYSIOLOGY)
Objective workload and behavioural response in airport radar control rooms
A78-47491
Performance, mood, and clinical symptoms in men exposed to prolonged, severe physical work and sleep deprivation
A78-48079
Simulator study for the determination of the demands upon the pilot in the case of unconventional, spatially curved approach profiles --- German thesis
A78-49406
Methods to assess work load
[AGARD-CP-216] N78-31745
Methodolcgical considerations of visual workloads of helicopter pilots --- eye movement measurements
N78-31747
Auditory communication and workload --- human response time measurements to voice communication
N78-31749
Pitch and formant analysis of the voice in the investigation of pilot workshop
N78-31750
Determination of stress and strain of air traffic control officers --- physiological response measurements
N78-31751
Instruments and methodology for the assessment of physiological cost of performance of stressful continuous operations: The air traffic services tower environment
N78-31752
Physiological measures of workloads: Correlations between physiological parameters and operational performance
N78-31753
Use of Inspiratory Minute Volumes in evaluation of rotary and fixed wing pilot workload --- respiratory response to flight conditions
N78-31754
Neurophysiological assessment of functional states of the brain --- electroencephalographic responses to workloads
N78-31755
The human operator simulator: Workload estimation using a simulated secondary task
N78-31756
Operator workload assessment model: An evaluation of a VF/VA-V/STOL system
N78-31757

Mathematical analysis and computer simulation in military mission workload assessment
N78-31758

PERSONAL AUTHOR INDEX

Typical Personal Author Index Listing



The title of the document is used to provide the user with a brief description of the subject matter. The NASA or AIAA accession number is included in each entry to assist the user in locating the abstract in the abstract section of this supplement. If applicable, a report number is also included as an aid in identifying the document.

A

ACKER, B.
Measurements of potassium changes in the cat carotid body under hypoxia and hypercapnia
A78-49299

AGABEKOVA, I. I.
Age-related changes in glycolysis in the rat liver during high-altitude acclimatization
A78-49584

AGNOLI, A.
Cerebral energy state during or after hypoxia and complete or incomplete ischemia
A78-47210

AKERS, L. A.
Use of Inspiratory Minute Volumes in evaluation of rotary and fixed wing pilot workload
N78-31754

AKHMADIEVA, A. KH.
Genetic effects of cosmic radiation on bactericphage T4Er/+/ - On materials of biological experiment 'Soyuz-Apollo'
A78-48682

AKOEV, I. G.
Genetic effects of cosmic radiation on bactericphage T4Er/+/ - On materials of biological experiment 'Soyuz-Apollo'
A78-48682

ALBANESE, R. A.
Mathematical analysis and computer simulation in military mission workload assessment
N78-31758

AMDUR, M. O.
Physiological response to atmospheric pollutants
[PB-280413/6]
N78-31731

AMORETTI, B.
Electric impedance and mechanical recording, cardiovascular investigative methods in air medicine
A78-46951

ANIKEEVA, I. D.
The action of space flight factors on radiation effects of additional gamma-irradiation of seeds
A78-48611

Biological investigations on the orbital station 'Salyut-5'
A78-48679

ANISIMOV, G. V.
Visual work capacity under the action of overloads and elevated temperature
A78-47972

ANTIPOV, V. V.
Biological investigations on the orbital station 'Salyut-5'
A78-48679

ARRIGONI, E.
Cerebral energy state during or after hypoxia and complete or incomplete ischemia
A78-47210

ASANO, T.
Retinal hemorrhage in high mountain climbers
A78-47113

ASHWORTH, B. R.
A seat cushion to provide realistic acceleration cues for aircraft simulator pilots
[NASA-CASE-LAR-12149-2]
N78-30821

AVETIKIAN, SH. T.
Realignments of the cardiovascular system of a human operator under the action of negative gravity
A78-48760

B

BALCH, W. E.
Phytanyl-glycerol ethers and squalenes in the archaebacterium Methanobacterium thermoautotrophicum
A78-47892

BANCHERO, P. G.
Design and construction of the Donner 280-crystal positron ring for dynamic transverse section emission imaging
[LBL-5679]
N78-31721

BAR-YISHAY, E.
Factors determining maximal expiratory flows in the human lung
N78-31711

BARCHAS, J. D.
Serotonin involvement in pituitary-adrenal function
A78-48575

BARNES, J. A.
Use of eye-movement measures to establish design parameters for helicopter instrument panels
N78-31748

BARNES, M. J.
Display size and target acquisition performance
[AD-A054624]
N78-31741

BARTLEY, M. H.
Electrical enhancement of healing in combat injuries to hard and soft tissues
[AD-A055531]
N78-31718

BAUMGARDNER, F. W.
Preliminary analysis of available inflight respiratory data
[AD-A054241]
N78-30823

BEAUGENDRE, J.
Deterioration of human performance resulting from mechanical vibrations
A78-46955

BELL, P. R.
ORIS: The Oak Ridge Imaging System program listings
[CRNL-TM-5875-V3]
N78-31722

BELLIVEAU, J. W.
Calcium transport in Halobacterium halobium envelope vesicles
A78-48574

BENZI, G.
Cerebral energy state during or after hypoxia and complete or incomplete ischemia
A78-47210

BERDIER, R.
Age-related changes in glycolysis in the rat liver during high-altitude acclimatization
A78-49584

BERGER, P. A.
Serotonin involvement in pituitary-adrenal function
A78-48575

BERGER, R. L.
Variability of oxygen affinity of normal blood - An automated method of measurement
A78-47209

BIRCHER, H.
The microvibrations of the body, an index for examination stress
A78-49297

BLACK, J. H., JR.
Head rotational spectral characteristics during two-dimensional smooth pursuit tasks
A78-49263

BODROV, V. A.
Medical problems of rationalizing the work-rest regimen of astronauts
A78-47956

BONBRINGER, H. R.
Effect of gravity on lymphocyte activation
A78-48604

BOGDASHEVSKII, R. B.
Operator activity in a state of continuous wakefulness
A78-47969

BOGOMOLNI, R. A.
Illumination-dependent changes in the intrinsic fluorescence of bacteriorhodopsin
A78-48578

BONNARDEL, G.
The vibrating environment in transport vehicles: A critical bibliographical study
[RAE-LIB-TRANS-1917] N78-31738

BOOTH, F. W.
Biochemical adaptations of antigravity muscle fibers to disuse atrophy
[NASA-CR-151822] N78-30796

BORDEIANU, A.
The gastrointestinal tract in hypokinetic rats
A78-48587

BORLAND, R. G.
Pitch and formant analysis of the voice in the investigation of pilot workshop
N78-31750

BRAHMACHARI, H. D.
Hypoxia tolerance in rats in relation to tissue glycogen levels
A78-48078

BROEZE, R. J.
The 70 S monosome accumulation and in vitro initiation complex formation by Escherichia coli ribosomes at 5 C
[NASA-CR-157591] N78-31691

BROWN, R. J.
Biochemical oxygen demand, volume 2. A bibliography with abstracts
[NTIS/PS-78/0574/0] N78-30801
Biochemical oxygen demand, volume 3. A bibliography with abstracts
[NTIS/PS-78/0575/7] N78-30802

BUDINGER, T. F.
Design and construction of the Donner 280-crystal positron ring for dynamic transverse section emission imaging
[LBL-5679] N78-31721

BUECKER, H.
Dosimetric and biological results from the Bacillus subtilis Biostack experiment within the ASTP
A78-48598

A special photoproduct in DNA, UV-irradiated in vacuo
A78-48623

BUKHOMKIN, A. V.
The astronaut in the astronavigation system of manned spacecraft
A78-47968

BURNS, R. E.
Disposal of radioactive iodine in space
[NASA-TP-1313] N78-31740

BURSE, R.
Influence of posture on isometric fatigue
A78-47207

BYER, W. L.
Nitrosamines
[PB-280479/7] N78-31727

BYNUM, G. D.
Hormonal responses of sedentary and exercising men to recurrent heat exposure
A78-48084

C

CAHOON, J. L.
Design and construction of the Donner 280-crystal positron ring for dynamic transverse section emission imaging
[LBL-5679] N78-31721

CALVIN, M.
Fermentation and hydrocarbons
[LBL-7270] N78-30800

CANANAU, S.
The gastrointestinal tract in hypokinetic rats
A78-48587

CANNINGS, R.
Pitch and formant analysis of the voice in the investigation of pilot workshop
N78-31750

CARPENTER, R. H. S.
Movements of the eyes
A78-48506

CARR, J. E.
Behavior therapy and the treatment of flight phobia
A78-48086

CARRE, R.
Electric impedance and mechanical recording, cardiovascular investigative methods in air medicine
A78-46951

CHATELIER, P. R.
Operator workload assessment model: An evaluation of a VF/VA-V/STOL system
N78-31757

CHERNIAVSKII, I. T.
Analog simulation of the movements of an ideal manipulator
A78-48511

CHERNYAKOV, I. N.
Evolution of the space suit
N78-31695

CLARK, J. R.
Work Capability and physiological effects Predictive studies. 4: in HE-02 excursions to pressures of 400-800-1200- and 1600 feet of sea water
[NASA-CR-157571] N78-31714

COGOLI, A.
Effect of gravity on lymphocyte activation
A78-48604

COLIN, J.
Electric impedance and mechanical recording, cardiovascular investigative methods in air medicine
A78-46951

COLLINS, W. E.
Spatial disorientation in general aviation accidents
A78-48081

COLUCCI, A. V.
Nitrogen oxides: Current status of knowledge
[EPRI-EA-668] N78-31723

COWSAR, D. R.
Study of reactive materials for development of new protective clothing concepts
[AD-A054877] N78-30826

CRAWFORD, R. D.
CSF pH and ventilatory acclimatization to altitude
A78-47208

CRIGLER, J. C.
Preliminary analysis of available inflight respiratory data
[AD-A054241] N78-30823

CROSBY, J. V.
A reaction time analysis of instrument scanning
A78-49275

D

DAGANI, F.
Cerebral energy state during or after hypoxia and complete or incomplete ischemia
A78-47210

DAMERON, D. H.
Diagnostic improvements in medical ultrasonic imaging systems
N78-31710

DAMOS, D. L.
Residual attention as a predictor of pilot performance
A78-49274

DAVIES, C. T. M.
An assessment of a N2O rebreathing method for the estimation of cardiac output during severe exercise
A78-47492

DEFIELD, J. G.
Disposal of radioactive iodine in space [NASA-TT-1313]
N78-31740

DEHAIO, J.
A reaction time analysis of instrument scanning
A78-49275

DEMCHENKO, I. T.
Aspects of a systems approach to the analysis of the vascular mechanisms of the brain
A78-48759

DEMEESTERE, M.
Hypoxia survival variations in male and female mice as functions of chronological and environmental factors
A78-48082

DEMENTEV, E. V.
Manual control of astronaut attitude with a three-stage setup
A78-47971

DERENZO, S. E.
Design and construction of the Donner 280-crystal positron ring for dynamic transverse section emission imaging [LBL-5679]
N78-31721

DICKERSON, R. E.
Chemical evolution and the origin of life
A78-47845

DOLA, T. J.
Effect of atropine upon the cerebrovascular system during GD-induced respiratory depression [AD-A054807]
N78-30811

DOMASZUK, J.
Man under conditions of weightlessness
A78-47482

DOSE, K.
A special photoproduct in DNA, UV-irradiated in vacuo
A78-48623

DOUGHERTY, J. M.
ORIS: The Oak Ridge Imaging System program listings [ORNL-TM-5875-V3]
N78-31722

DRAGOMIR, C. T.
The gastrointestinal tract in hypokinetic rats
A78-48587

DUBININ, N. P.
Some pressing problems of genetics
N78-31699

DUFFAUT, M.
Crises of maladaptation in confirmed pilots
A78-46959

DUROVA, S. I.
Age-related changes in glycolysis in the rat liver during high-altitude acclimatization
A78-49584

E

EGGLESTON, R. G.
Perceived magnitudes of distortion, secondary imaging, and rainbowing in aircraft windshields
A78-49272

EKANGER, R.
Performance, mood, and clinical symptoms in men exposed to prolonged, severe physical work and sleep deprivation
A78-48079

EPSTEIN, W.
Two factors in the perception of velocity at a distance
A78-48823

EREMIN, A. V.
Pilot training and prognosis of psychophysiological conditioning of astronauts
A78-47955

EYSEL, U. T.
Susceptibility of the cat's visual system to hypoxia, hypotonia and circulatory arrest
A78-49300

F

FABER, J. M.
Use of Inspiratory Minute Volumes in evaluation of rotary and fixed wing pilot workload
N78-31754

FACIUS, R.
Dosimetric and biological results from the Bacillus subtilis Biostack experiment within the ASTP
A78-48598

FAVRE, B.
The vibrating environment in transport vehicles: A critical bibliographical study [RAE-LIB-TRANS-1917]
N78-31738

FEDOSOVA, T. I.
Visual evaluation of simulated elements of lunar relief
A78-47987
Psychological state of the operator and visual evaluation of lunar relief
A78-47988

FERRET, B.
Reliability test report. Modular cryogenic generator [AD-A054855]
N78-30825

FIELDS, R. W.
Electrical enhancement of healing in combat injuries to hard and soft tissues [AD-A055531]
N78-31718

FIRSOV, L. A.
Processes of learning complex behavior
A78-49801

FLETCHER, M. E.
Work Capability and physiological effects Predictive studies. 4: in HE-02 excursions to pressures of 400-800-1200- and 1600 feet of sea water [NASA-CR-157571]
N78-31714

FLORES, J. L.
The vibrating environment in transport vehicles: A critical bibliographical study [RAE-LIB-TRANS-1917]
N78-31738

FLUX, M.
Altitude tolerance of general aviation pilots with normal or partially impaired spirometric function
A78-48088

FLUX, R.
Auditory communication and workload
N78-31749

FOX, G. E.
Archaebacteria
A78-47891
Phytanyl-glycerol ethers and squalenes in the archaebacterium Methanobacterium thermoautotrophicum
A78-47892

FRANCESCONI, R. P.
Hormonal responses of sedentary and exercising men to recurrent heat exposure
A78-48084

FROLOV, A. IA.
Visual work capacity under the action of overloads and elevated temperature
A78-47972
Bioenergetics of control in the state of simulated weightlessness
A78-47980
Ergonomic evaluation of cross-hair sights
A78-47982
The recognition of objects against a model of cosmic sky
A78-47983
Visual evaluation of simulated elements of lunar relief
A78-47987
Psychological state of the operator and visual evaluation of lunar relief
A78-47988

FROST, B. J.
Subjective motion and acceleration induced by the movement of the observer's entire visual field
A78-48824

FUGAS, M.
Biological significance of some metals as air pollutants. Part 2: Mercury [PB-279670/4]
N78-30814

FUNG, Y. C.
Elasticity of excised dog lung parenchyma
A78-47206

G

GALAKTIONOVA, G. V.
Proliferation of bone marrow cells under the influence of superhigh intensity steady magnetic fields
N78-31707
GANALEYA, N. F.
Genetics of microorganisms and medicine
N78-31698
GAMES, L. M.
Methane-producing bacteria - Natural fractionations of the stable carbon isotopes
A78-47667
GELFAND, H.
Work Capability and physiological effects Predictive studies. 4: in HE-02 excursions to pressures of 400-800-1200- and 1600 feet of sea water
[NASA-CR-157571] N78-31714
GELLY, B.
Crises of maladaptation in confirmed pilots
A78-46959
GERZANICH, I. I.
State of hypothalamo-hypophyseal neurosecretory system during hyperbaric oxygenation
A78-49700
GIBSON, C. C.
Variability of oxygen affinity of normal blood - An automated method of measurement
A78-47209
GLANFIELD, E. J.
Urine monitoring system failure analysis and operational verification test report
[NASA-CR-151828] N78-30820
GOLDMAN, M. F.
Convergence of skin and rectal temperatures as a criterion for heat tolerance
A78-48083
GOMEZ, F. E.
Perceived magnitudes of distortion, secondary imaging, and rainbowing in aircraft windshields
A78-49272
GONZALES, C.
Serotonin involvement in pituitary-adrenal function
A78-48575
GRAPE, P. M.
Spatial disorientation in general aviation accidents
A78-48081
GRAYBIEL, A.
Longevity in military pilots - 37-year followup of the Navy's '1000 Aviators'
A78-48087
GREEN, M.
Auditory communication and workload
N78-31749
GREENING, C. P.
Analysis of crew/cockpit models for advanced aircraft
[AD-A054957] N78-30824
GREGOIRE, H. G.
Is man the weakest link?
N78-31746
GRIFFIN, M. J.
The effect of rotational vibration in roll and pitch axes on the discomfort of seated subjects
A78-50080
Predicting the effects of dual-frequency vertical vibration on continuous manual control performance
A78-50081
GRIMAK, L. P.
Psychological model of weightlessness in space flight simulation
A78-47958
Emotional state and orthostatic reactions
A78-47960
Suggestibility and characterological features of personality
A78-47961
Biological model of a self-adjusting filter
A78-47965
Visual evaluation of simulated elements of lunar relief
A78-47987
Psychological state of the operator and visual evaluation of lunar relief
A78-47988
GRIMES, C. T.
The psychophysical tuning curve: A parametric study
N78-30807
GROZA, P.
The gastrointestinal tract in hypokinetic rats
A78-48587
GRUNWALD, A. J.
Effectiveness of basic display augmentation in vehicular control by visual field cues
A78-49262
GUNSALUS, R. P.
Methane-producing bacteria - Natural fractionations of the stable carbon isotopes
A78-47667
GUSEV, V. M.
Mechanisms of interaction between receptors of the vestibular system
A78-48522

H

HARLAN, W. R.
Longevity in military pilots - 37-year followup of the Navy's '1000 Aviators'
A78-48087
HARO, F. J.
Loss of circadian rhythmicity in body temperature and locomotor activity following suprachiasmatic lesions in the rat
A78-48576
HARRIS, S. L.
Description and analysis of the Hewlett-Packard 78220 arrhythmia monitoring system
[AD-A055451] N78-31720
HARRISON, E. A.
Hypothermia. A bibliography with abstracts
[NTIS/PS-78/0517/9] N78-30816
Cold weather stress on humans. A bibliography with abstracts
[NTIS/PS-78/0540/1] N78-31732
HATZE, H.
A general myocybernetic control model of skeletal muscle
[CSIR-SR-WISK-280] N78-30809
HAYES, J. M.
Methane-producing bacteria - Natural fractionations of the stable carbon isotopes
A78-47667
HEINZE, W.
Simulator study for the determination of the demands upon the pilot in the case of unconventional, spatially curved approach profiles
A78-49406
HELGERSON, S. L.
Methionine transport in Halobacterium halobium vesicles - Noncompetitive, asymmetric inhibition by L-Cysteine
A78-48579
HERMANN, E. H.
Effects of noise and hearing acuity upon visual depth perception and safety among humans
[PB-280365/8] N78-30812
HERN, S. C.
Distribution of phytoplankton in Tennessee lakes
[PB-280139/7] N78-30803
Distribution of phytoplankton in Ohio lakes
[PB-280140/5] N78-30804
HESTNES, A.
Simulation of circumnutations - Behaviour under different g's
A78-48684
HIATT, F. A.
Distribution of phytoplankton in Tennessee lakes
[PB-280139/7] N78-30803
Distribution of phytoplankton in Ohio lakes
[PB-280140/5] N78-30804
HILGERT, J. W.
Distribution of phytoplankton in Tennessee lakes
[PB-280139/7] N78-30803
Distribution of phytoplankton in Ohio lakes
[PB-280140/5] N78-30804
HILL, L. E.
Pitch and formant analysis of the voice in the investigation of pilot workshop
N78-31750

HODGSON, T.
Instrumentation for the measurement of the evaporative and radiative heat loss rates from man in a normal working mode
N78-30819
HOFMANN, M. A.
Visual workload of the copilot/navigator during terrain flight
[AD-A055038] N78-31742
HOLMQUIST, B.
A measure of the denseness of a phylogenetic network
A78-47890
HOLZER, G.
Phytanyl-glycerol ethers and squalenes in the archaebacterium Methanobacterium thermoautotrophicum
A78-47892
HORDINSKY, J. R.
SMD 3 post test medical report
[NASA-TM-79750] N78-30799
HORNECK, G.
Dosimetric and biological results from the Bacillus subtilis Biostack experiment within the ASTP
A78-48598
A special photoproduct in DNA, UV-irradiated in vacuo
A78-48623
HOROWITZ, J. M.
Effect of altered gravity on temperature regulation in mammals: Investigation of gravity effect on temperature regulation in mammals
[NASA-CR-157570] N78-30797
HORWITZ, B. A.
Effect of altered gravity on temperature regulation in mammals: Investigation of gravity effect on temperature regulation in mammals
[NASA-CR-157570] N78-30797
HSIAO, S. H.
A literature review: Problem definition studies on selected toxic chemicals. Volume 6: Occupational health and safety and environmental aspects of urea-formaldehyde resins
[AD-A054991] N78-31716
HUESMAN, R. H.
Design and construction of the Donner 280-crystal positron ring for dynamic transverse section emission imaging
[LBL-5679] N78-31721
HURST, M. W.
Objective workload and behavioural response in airport radar control rooms
A78-47491

I

IKELS, K. G.
Molecular sieve generation of aviator's oxygen: Breathing gas composition as a function of flow, inlet pressure, and cabin altitude
[AD-A054240] N78-30822
ILINSKIY, O. B.
Electroreceptors in man and other animals
N78-31696
IMSHENETSKII, A. A.
Microorganisms of the upper layers of the atmosphere and protective role of their cell pigments
A78-48712
ISAKOV, P. K.
Psychophysiological characteristics of pilot activity during low-altitude flights over the sea
A78-48410
ISHAY, J. S.
Hornet building orientation in a vertically rotating centrifuge
A78-48713
Hypergravity - Its effect on the estrous cycle and hormonal levels in female rats
A78-48722
ISHAY, Z. J.
Hornet building orientation in a vertically rotating centrifuge
A78-48713
IUROV, S. S.
Genetic effects of cosmic radiation on bactericphage T4Br/+/ - On materials of biological experiment 'Soyuz-Apollo'
A78-48682
IVANOV, E. A.
Method of evaluating the work capacity of pilots and astronauts
A78-47962
Visual work capacity under the action of overloads and elevated temperature
A78-47972
Spaceflight stress factors and the ability to track
A78-47973
Mechanisms of self-regulation of the functional system of tracking in normal and pathological states
A78-47979
Some aspects of depth perception in space
A78-47981
The recognition of objects against a model of cosmic sky
A78-47983
IZAKOV, V. IA.
Mathematical model of the contractile activity and the chronoinotropism of the myocardium
A78-48755

J

JAGACINSKI, R. J.
Describing the human operator's internal model of a dynamic system
A78-49273
JAHNS, D. W.
Operator workload assessment model: An evaluation of a VF/VA-V/STOL system
N78-31757
JOHNSON, E.
Longevity in military pilots - 37-year followup of the Navy's '1000 Aviators'
A78-48087
JOHNSON, J. E., JR.
Spectrophotofluorometric and electron microscopic study of Lipofuscin accumulation in the testis of aging mice
A78-48581
JOHNSSON, A.
Simulation of circumnutations - Behaviour under different g's
A78-48684
JOHNSTON, E. A.
Application of commercially available filter components for psychoacoustic testing
A78-49898
JORDAN, D.
Atrial flutter - Electrocardiographic, vectorcardiographic and echocardiographic correlation
A78-49150
JUKES, T. H.
Neutral changes during divergent evolution of hemoglobins
A78-47893
JUNGCK, J. R.
The genetic code as a periodic table
A78-47889

K

KABMANOVA, I. G.
Evolution of sleep: Stages of formation of the wakefulness-sleep cycle in a number of vertebrates
A78-48524
KASATKINA, T. B.
Biological investigations on the orbital station 'Salyut-5'
A78-48679
KATZ, A.
Nitrosamines
[PB-280479/7] N78-31727
KATZ, R.
Vibration aspects of ride quality modeling for the DOT PTACV: Theory and experiment
[PB-279846/0] N78-31744
KAVEESHWAR, U.
Hypoxia tolerance in rats in relation to tissue glycogen levels
A78-48078
KAZACHKOV, V. M.
Effect of spectral filtering during continuous two-day work
A78-47986

KELLAR, K. J.
Serotonin involvement in pituitary-adrenal function
A78-48575
KENT, D.
Serotonin involvement in pituitary-adrenal function
A78-48575
KERESZTESY, J.
Nitrosamines
[PB-280479/7] N78-31727
KHACHATURIANTS, L. S.
Characteristics of cosmonaut activities during flight
A78-47951
Adaptational fluctuations in the initial state of space flight
A78-47953
Psychological model of weightlessness in space flight simulation
A78-47958
Method of investigating perceptual extrapolation
A78-47963
Radio telegraphy as a realistic test for investigating an astronaut's activity
A78-47964
Human operator in a spacecraft control system during descent in the atmosphere
A78-47970
Spaceflight stress factors and the ability to track
A78-47973
Mechanisms of self-regulation of the functional system of tracking in normal and pathological states
A78-47979
Effect of spectral filtering during continuous two-day work
A78-47986
Psychological state of the operator and visual evaluation of lunar relief
A78-47988
KHLUDEEV, E. N.
Effect of spectral filtering during continuous two-day work
A78-47986
KHRUNOV, E. V.
The astronaut in the astronavigation system of manned spacecraft
A78-47968
KIMBALL, K. A.
Methodological considerations of visual workloads of helicopter pilots
N78-31747
KING, J. M.
Effects of simulated hypogravity on respiration and photosynthesis of higher plants
A78-48680
KIRKHAM, W. R.
Spatial disorientation in general aviation accidents
A78-48081
KIRSANOVA, G. I.
Dependence of the reaction of the human nervous system on the distribution of absorbed doses of ionizing radiation
N78-31704
KISELEV, S. V.
Biological model of a self-adjusting filter
A78-47965
KISLIAKOV, V. A.
Mechanisms of interaction between receptors of the vestibular system
A78-48522
KLEIN, M. J.
Study of the specific effects of microwaves on the central nervous system. I - Demonstration of modifications of cerebral electrogenesis in the rat
A78-46953
KLESHCHEV, A. S.
Processes of learning complex behavior
A78-49801
KNOX, R. J.
Analytical study of electrophoretic characterization of kidney cells
[NASA-CR-150790] N78-31713
KOBRINSKII, A. A.
Analog simulation of the movements of an ideal manipulator
A78-48511
KODAMA, A. M.
Continuous metabolic and cardiovascular measurements on a monkey subject during a simulated 6-day Spacelab mission
A78-48719
KOHL, J.
The microvibrations of the body, an index for examination stress
A78-49297
KOLLER, E. A.
The microvibrations of the body, an index for examination stress
A78-49297
KONIKOFF, P.
Hornet building orientation in a vertically rotating centrifuge
A78-48713
Hypergravity - Its effect on the estrous cycle and hormonal levels in female rats
A78-48722
KOSTINA, L. M.
The action of space flight factors on radiation effects of additional gamma-irradiation of seeds
A78-48611
Biological investigations on the orbital station 'Salyut-5'
A78-48679
KOTOVSKAIA, A. R.
Visual work capacity under the action of overloads and elevated temperature
A78-47972
KRAHENBUHL, G. S.
Task-specific simulator pretraining and in-flight stress of student pilots
A78-48085
KREUZER, F.
Blood gases at several levels of oxygenation in rats with a left-shifted blood oxygen dissociation curve
A78-50024
KRIKORIAN, A. D.
Is gravity a morphological determinant in plants at the cellular level
A78-48699
KRYLOVA, N. V.
Radio telegraphy as a realistic test for investigating an astronaut's activity
A78-47964
Visual work capacity of an operator
A78-47985
KUGNO, K. P.
Visual-motor coordination in the simulation of 10-day reduced gravity
A78-47976
KUKSINSKIY, V. Y.
Coagulative properties of blood and tissues of the cardiovascular system in exposure to electromagnetic fields
N78-31706
KURTZ, P. J.
Toxicological evaluation of Pyrethrins Fogging Concentrate (trade name) study No. 51-1309-78
[AD-A055088] N78-31715
KUSHLICK, S.
Man-environment studies: A review with an analysis of some techniques for the assessment of environmental perception
[CSIR-SF-PERS-271] N78-30817
KUZNETSOV, O. N.
Operator activity in a state of continuous wakefulness
A78-47969

L

LACEY, J. C., JR.
Genetic code correlations - Amino acids and their anticodon nucleotides
A78-47888
LACH, S. P.
Microorganisms of the upper layers of the atmosphere and protective role of their cell pigments
A78-48712
LAFONTAINE, E.
Concorde and cosmic rays
A78-46952

LAMBERTSEN, C. J.
Work Capability and physiological effects Predictive studies. 4: in HE-02 excursions to pressures of 400-800-1200- and 1600 feet of sea water
[NASA-CR-157571] N78-31714
LAMBOU, V. W.
Distribution of phytoplankton in Tennessee lakes
[PB-280139/7] N78-30803
Distribution of phytoplankton in Ohio lakes
[PB-280140/5] N78-30804
LANE, N. E.
The human operator simulator: Workload estimation using a simulated secondary task
N78-31756
LANYI, J. K.
Calcium transport in Halobacterium halobium envelope vesicles
A78-48574
Illumination-dependent changes in the intrinsic fluorescence of bacteriorhodopsin
A78-48578
Methionine transport in Halobacterium halobium vesicles - Noncompetitive, asymmetric inhibition by L-Cysteine
A78-48579
LAPLANE, B.
Concorde and cosmic rays
A78-46952
LATEGOLA, M. T.
Altitude tolerance of general aviation pilots with normal or partially impaired spirometric function
A78-48088
LAVERNHE, J.
Concorde and cosmic rays
A78-46952
LEBEDEVA, N. N.
Method of evaluating the work capacity of pilots and astronauts
A78-47962
Spaceflight stress factors and the ability to track
A78-47973
Mechanisms of self-regulation of the functional system of tracking in normal and pathological states
A78-47979
LELYVELD, J.
Hypergravity - Its effect on the estrous cycle and hormonal levels in female rats
A78-48722
LEONTEVA, G. A.
Genetic effects of cosmic radiation on bacteriophage T4Br/+/ - On materials of biological experiment 'Soyuz-Apollo'
A78-48682
LEVARTOVSKII, B.
Analysis of the contractility of the myocardium of different heart chambers by means of comparing the isometric contraction of isolated stria and the strain-gage recording of isometric stress of the myocardium of an intact functioning heart
A78-48753
LEWIS, C. H.
Predicting the effects of dual-frequency vertical vibration on continuous manual control performance
A78-50081
LEWIS, D. B.
Study of reactive materials for development of new protective clothing concepts
[AD-A054877] N78-30826
LEWIS, M. A.
Use of the occupational knowledge test to assign extra credit in selection of air traffic controllers
[AD-A053675] N78-30818
LIND, A. R.
Influence of posture on isometric fatigue
A78-47207
LINTON, P. M.
Operator workload assessment model: An evaluation of a VF/VA-V/STOL system
N78-31757
LIPP, J. A.
Effect of atropine upon the cerebrovascular system during GD-induced respiratory depression
[AD-A054807] N78-30811
LISHCHUK, V. A.
Modeling of the heart pumping function
A78-48758
General approach to the modeling of the blood circulation
A78-48762
LITSOV, A. N.
Information processing under emotionally saturated conditions of activity
A78-47957
LIVANOVA, I. A.
Genetic effects of cosmic radiation on bacteriophage T4Br/+/ - On materials of biological experiment 'Soyuz-Apollo'
A78-48682
LOMOV, B. F.
Characteristics of cosmonaut activities during flight
A78-47951
LUNDGREN, P. R.
Spectrophotofluorometric and electron microscopic study of Lipofuscin accumulation in the testis of aging mice
A78-48581
LYNE, P. J.
Altitude tolerance of general aviation pilots with normal or partially impaired spirometric function
A78-48088
LYSENKO, S. V.
Microorganisms of the upper layers of the atmosphere and protective role of their cell pigments
A78-48712

M

MACINTYRE, N. B.
Longevity in military pilots - 37-year followup of the Navy's '1000 Aviators'
A78-48087
MACKO, J. A., JR.
Toxicological evaluation of Pyrethrins Fogging Concentrate (trade name) study No. 51-1309-78
[AD-A055088] N78-31715
MADDOCK, J. T.
Nitrosamines
[PB-280479/7] N78-31727
Strong sensitizers
[PB-280475/5] N78-31728
MAGRUM, L. J.
Archaebacteria
A78-47891
MAHER, J. T.
Hormonal responses of sedentary and exercising men to recurrent heat exposure
A78-48084
MAINS, R. C.
Continuous metabolic and cardiovascular measurements on a monkey subject during a simulated 6-day Spacelab mission
A78-48719
MAKAROV, G. P.
Justification of the use of artificial gravity in space flight
A78-47959
Bioenergetics of control in the state of simulated weightlessness
A78-47980
MAKHOV, N. A.
Human operator in a spacecraft control system during descent in the atmosphere
A78-47970
MALKIN, V. B.
Evolution of the space suit
N78-31695
MALOFEEV, A. A.
Detection of terrestrial landmarks during dark adaptation
A78-47984
MALSEED, B. T.
Nitrosamines
[PB-280479/7] N78-31727
MANO, T.
Effects of partial body weightlessness on the vestibulo-ocular reflex in man
A78-47112
MARENNYI, A. M.
Genetic effects of cosmic radiation on bacteriophage T4Br/+/ - On materials of biological experiment 'Soyuz-Apollo'
A78-48682

MARETT, J. R.
Task-specific simulator pretraining and in-flight stress of student pilots
A78-48085
MARMOLIN, H.
Correlations between night vision tests
[FOA-C-56014-H9] N78-31726
MASON, J. W.
Hormonal responses of sedentary and exercising men to recurrent heat exposure
A78-48084
MASSE, N.
Hypoxia survival variations in male and female mice as functions of chronological and environmental factors
A78-48082
MCCUTCHEON, E. P.
Continuous metabolic and cardiovascular measurements on a monkey subject during a simulated 6-day Spacelab mission
A78-48719
MCKINLEY, R. L.
Application of commercially available filter components for psychoacoustic testing
A78-49898
MCNEIL, R. J.
Use of Inspiratory Minute Volumes in evaluation of rotary and fixed wing pilot workload
N78-31754
MEGOSY, M.
Hornet building orientation in a vertically rotating centrifuge
A78-48713
Hypergravity - Its effect on the estrous cycle and hormonal levels in female rats
A78-48722
MELWIN, S. G.
Psychophysiological characteristics of pilot activity during low-altitude flights over the sea
A78-48410
MENITSKII, D. N.
Mechanisms of self-regulation of the functional system of tracking in normal and pathological states
A78-47979
Realignments of the cardiovascular system of a human operator under the action of negative gravity
A78-48760
MERHAV, S. J.
Effectiveness of basic display augmentation in vehicular control by visual field cues
A78-49262
MERTENS, H. W.
Comparison of the visual perception of a runway model in pilots and nonpilots during simulated night landing approaches
A78-48076
METKER, L. W.
Toxicological evaluation of Pyrethrins Fogging Concentrate (trade name) study No. 51-1309-78
[AD-A055088] N78-31715
METLIN, V. I.
Radio telegraphy as a realistic test for investigating an astronaut's activity
A78-47964
Human operator in a spacecraft control system during descent in the atmosphere
A78-47970
Visual work capacity of an operator
A78-47985
Effect of spectral filtering during continuous two-day work
A78-47986
MILHAUD, C. I.
Study of the specific effects of microwaves on the central nervous system. I - Demonstration of modifications of cerebral electrogenesis in the rat
A78-46953
MILLER, H. D.
An experimental investigation of the effect of 1.06 micrometers laser light on the transparent ocular media
[AD-A055650] N78-31719
MILLER, R. A.
Describing the human operator's internal model of a dynamic system
A78-49273
MILLER, R. L.
Molecular sieve generation of aviator's oxygen: Breathing gas composition as a function of flow, inlet pressure, and cabin altitude
[AD-A054240] N78-30822
MIQUEL, J.
Spectrophotofluorometric and electron microscopic study of lipofuscin accumulation in the testis of aging mice
A78-48581
MIRONENKO, V. I.
Use of a mathematical model for identifying the role of the cardiac component in the regulation of hemodynamics
A78-48757
Investigation of the role of basic parameters of blood circulation in the regulation of hemodynamic by means of a mathematical model, identified in an experiment
A78-48761
MITARAI, G.
Effects of partial body weightlessness on the vestibulo-ocular reflex in man
A78-47112
Retinal hemorrhage in high mountain climbers
A78-47113
MITCHELL, R. E.
Longevity in military pilots - 37-year followup of the Navy's '1000 Aviators'
A78-48087
MODELL, W.
Technology requirements for non-terrestrial ecosystems
A78-48666
MONIN, V. L.
Biological model of a self-adjusting filter
A78-47965
MONK, D. L.
Head rotational spectral characteristics during two-dimensional smooth pursuit tasks
A78-49263
MORF, M.
Effect of gravity on lymphocyte activation
A78-48604
MORGAN, T. E.
Preliminary analysis of available inflight respiratory data
[AD-A054241] N78-30823
MORRIS, F. A.
Distribution of phytoplankton in Tennessee lakes
[PB-280139/7] N78-30803
Distribution of phytoplankton in Ohio lakes
[PB-280140/5] N78-30804
MORRIS, M. K.
Distribution of phytoplankton in Tennessee lakes
[PB-280139/7] N78-30803
Distribution of phytoplankton in Ohio lakes
[PB-280140/5] N78-30804
MORRISSEY, J. M.
Variability of oxygen affinity of normal blood - An automated method of measurement
A78-47209
MOSKALENKO, YU. E.
Aspects of a systems approach to the analysis of the vascular mechanisms of the brain
A78-48759
MOVCHAN, YU. I.
Visual evaluation of simulated elements of lunar relief
A78-47987
Psychological state of the operator and visual evaluation of lunar relief
A78-47988

N

NAKAJIMA, J.
Microbiological study of bioecological system. I
A78-47111
Changes of closely related enzymes and minerals to neuro-muscular systems of albino rats, during prolonged exposure to simulated hypogravics
A78-48645
NAKAYA, N.
Microbiological study of bioecological system. I
A78-47111

Changes of closely related enzymes and minerals to neuro-muscular systems of albinc rats, during prolcnged exposure to simulated hypogravics
A78-48645

NEBOIT, M.
Choice and analytic techniques involving indices of visual information input. I
A78-46954

NEFF, D.
Strong sensitizers
[PB-280475/5] N78-31728

NICHOLSON, A. N.
Pitch and formant analysis of the voice in the investigation of pilot workshop
N78-31750

NIGG, B.
The microvibrations of the body, an index for examinatien stress
A78-49297

NIKOLAEV, A. G.
Characteristics of cosmonaut activities during flight
A78-47951
Results of visual chservations of the atmosphere and landscapes frcm manned spacecraft
A78-47989

NISHIMURA, T.
Effects of partial body weightlessness on the vestibulo-ocular reflex in man
A78-47112

NUMMESTAD, M.
Performance, mood, and clinical symptoms in men exposed to prolonged, severe physical work and sleep deprivatien
A78-48079

O

OBERMAN, A.
Longevity in military pilots - 37-year followup of the Navy's '1000 Aviators'
A78-48087

OBORNE, D. J.
The stability of equal sensation contours for whole-bcdy vibration
A78-50082

OFFENLOCH, K.
Neurophysiological assessment of functicnal states of the brain
N78-31755

OKAMOTO, T.
Microbiological study of bioecological system. I
A78-47111

OKOMOTO, T.
Changes of closely related enzymes and minerals to neuro-muscular systems cf albinc rats, during prolonged exposure to simulated hypogravics
A78-48645

OPSTAD, P. K.
Performance, mood, and clinical symptoms in men exposed to prolonged, severe physical work and sleep deprivatien
A78-48079

ORLOV, I. V.
Mechanisms of interaction between receptcrs of the vestibular systen
A78-48522

ORO, J.
Phytanyl-glycerol ethers and squalenes in the archaebacterium Methanobacterium thermoautctrophicum
A78-47892

OYAMA, J.
Rat growth during chronic centrifugation
A78-48640

P

PACE, N.
Continuous metabolic and cardiovascular measurements cn a monkey subject during a simulated 6-day Spacelab mission
A78-48719

PALMBAKH, L. B.
Biological investigations on the orbital station 'Salyut-5'
A78-48679

PANDOLF, K. B.
Convergence of skin and rectal temperatures as a criterion for heat tolerance
A78-48083

PAPIN, J. P.
Choice and analytic techniques involving indices of visual information input. I
A78-46954

PARKINSON, S. R.
A reaction time analysis of instrument scanning
A78-49275

PARSONS, K. C.
The effect of rotational vibration in roll and pitch axes on the discomfort of seated subjects
A78-50080

PASTORIS, O.
Cerebral energy state during or after hypoxia and complete or incomplete ischemia
A78-47210

PASTERNAK, A.
Visual evoked responses to the upper and lower half-field stimulation in a dark-adapted man
A78-50025

PASTERNAKOVA, I.
Visual evoked responses to the upper and lower half-field stimulation in a dark-adapted man
A78-50025

PEREGRIN, J.
Visual evoked responses to the upper and lower half-field stimulation in a dark-adapted man
A78-50025

PERNA, B.
Hornet building orientation in a vertically rotating centrifuge
A78-48713

PETROFSKY, J. S.
Influence of posture on isometric fatigue
A78-47207

PETROVIC, B.
Interrelation of psychosomatic troubles and psychcneurotic troubles in aeronautics
A78-46958

PETRUSINSKII, V. V.
Biological model of a self-adjusting filter
A78-47965

PETTYJOHN, F. S.
Use of Inspiratory Minute Volumes in evaluation of rotary and fixed wing pilot workload
N78-31754

PIKOVSKII, IU. B.
Method of investigating perceptual extrapolation
A78-47963

PINTILIE, I.
Contribution to the diagnosis of painless ischemic cardiopathy in flight personnel
A78-46957

PITTS, G. C.
Rat growth during chronic centrifugation
A78-48640

POIRIER, J. L.
Deterioration of human performance resulting from mechanical vibrations
A78-46955

POPE, D. H.
The 70 S monosome accumulation and in vitro initiation complex formation by Escherichia coli ribosomes at 5 C
[NASA-CR-157591] N78-31691

POPESCU, T. C.
Contribution to the diagnosis of painless ischemic cardiopathy in flight personnel
A78-46957

POPOV, E. P.
Manipulators: Dynamics and algorithms
A78-48529

POPOV, V. A.
Method of investigating perceptual extrapolation
A78-47963

POPOV, V. I.
Genetic effects of cosmic radiation on bacteriophage T4Br/+/ - On materials of biological experiment 'Soyuz-Apollo'
A78-48682

POSTOLATII, V. M.
Possibility of attenuating the ecological effects of alternating current power lines as a result of new designs and circuit changes
N78-31708

POTTIER, A.
Choice and analytic techniques involving indices of visual information input. I
A78-46954

POZDNIAKOV, V. V.
Operator activity in a state of continuous wakefulness
A78-47969

PRINZ, J. H.
Late biological effects of ionizing radiation as influenced by dose, dose rate, age at exposure, and genetic sensitivity to neoplastic transformation
[LA-UR-78-681] N78-31724

PROPHET, W. H.
US Navy fleet aviation training program development
[AD-A055786] N78-31734

PUIMEAU-CHIEZE, J. P.
Choice and analytic techniques involving indices of visual information input. I
A78-46954

PURSHOTTAM, T.
Hypoxia tolerance in rats in relation to tissue glycogen levels
A78-48078

PUTYATIN, S. P.
Possibility of attenuating the ecological effects of alternating current power lines as a result of new designs and circuit changes
N78-31708

R

RAABE, W.
Performance, mood, and clinical symptoms in men exposed to prolonged, severe physical work and sleep deprivation
A78-48079

RAHLMANN, D. F.
Continuous metabolic and cardiovascular measurements on a monkey subject during a simulated 6-day Spacelab mission
A78-48719

REED, H. D.
The effect of high altitude on pyridine nucleotides and adenosine phosphates in the liver of the rat
N78-31689

REGAN, J.
Involuntary automatic processing in color-naming tasks
A78-48825

REID, D. H.
Preliminary analysis of available inflight respiratory data
[AD-A054241] N78-30823

REID, G. B.
Task-specific simulator pretraining and in-flight stress of student pilots
A78-48085

REIMHERR, G. W.
Bionics. A bibliography with abstracts
[NTIS/PS-78/0550/0] N78-31693

REITZ, G.
Dosimetric and biological results from the Bacillus subtilis Biostack experiment within the ASTP
A78-48598

RHEE, J. J.
Atrial flutter - Electrocardiographic, vectorcardiographic and echocardiographic correlation
A78-49150

RICHTER, W.
Laser-induced thermal damage of skin
[AD-A054612] N78-30810

RINEHART, J. S.
Influence of posture on isometric fatigue
A78-47207

RINGWALDA, B. E. M.
Blood gases at several levels of oxygenation in rats with a left-shifted blood oxygen dissociation curve
A78-50024

ROBERTS, E., JR.
Digital enhancement of computerized axial tomograms
[NASA-TM-78974] N78-31690

ROCHA, H. A. F.
Development and evaluation of an ultrasonic imaging system
[PB-279834/6] N78-31729

ROCHELLE, R. H.
Influence of posture on isometric fatigue
A78-47207

ROHBERT, W.
Determination of stress and strain of air traffic control officers
N78-31751

ROMANTSEV, M. P.
The astronaut in the astronavigation system of manned spacecraft
A78-47968

ROSE, R. M.
Objective workload and behavioural response in airport radar control rooms
A78-47491

RUSSELL, P. E.
Behavior, ecology and toxicity of venomous marine fishes
[AD-A054925] N78-31692

S

SADOIAN, D. G.
General approach to the modeling of the blood circulation
A78-48762

SAIKI, H.
Microbiological study of bioecological system. I
A78-47111
Changes of closely related enzymes and minerals to neuro-muscular systems of albino rats, during prolonged exposure to simulated hypogravics
A78-48645

SALEH, M. A.
Loss of circadian rhythmicity in body temperature and locomotor activity following suprachiasmatic lesions in the rat
A78-48576
Effect of suprachiasmatic lesions on diurnal heart rate rhythm in the rat
A78-48580

SANDERS, M. G.
Visual workload of the copilot/navigator during terrain flight
[AD-A055038] N78-31742

SANDERS, M.
Analysis of the contractility of the myocardium of different heart chambers by means of comparing the isometric contraction of isolated stria and the strain-gage recording of isometric stress of the myocardium of an intact functioning heart
A78-48753

SARAEV, I. P.
Information processing under emotionally saturated conditions of activity
A78-47957

SAUTKIN, V. S.
A variant of portable single-channel bioradiotelemetry system
N78-31702

SAVARA, B. S.
Electrical enhancement of healing in combat injuries to hard and soft tissues
[AD-A055531] N78-31718

SCHAEFER, H.
Dosimetric and biological results from the Bacillus subtilis Biostack experiment within the ASTP
A78-48598

SCHEIDEGG, C. P.
Contrast sensitivity of the human visual system at one luminance level while adapted to a stimulus at another luminance level
[AD-A055238] N78-31717

SCHOPF, J. W.
The evolution of the earliest cells
A78-47846

SEMENOV, L. A.
Mechanisms of interaction between receptors of the vestibular system
A78-48522

SERGEEV, V. I.
Analog simulation of the movements of an ideal manipulator
A78-48511

SEVERINGHAUS, J. W.
CSF pH and ventilatory acclimatization to altitude
A78-47208
SHANDURINA, A. N.
Mechanisms of self-regulation of the functional system of tracking in normal and pathological states
A78-47979
SHAPTALA, A. A.
A variant of portable single-channel bioradictelemetry system
N78-31702
SHAUROV, V. N.
Visual evaluation of simulated elements of lunar relief
A78-47987
SHCHEMELEV, N. P.
Psychophysiological characteristics of pilot activity during low-altitude flights over the sea
A78-48410
SHEVCHENKO, V. V.
The astronaut in the astronavigation system of manned spacecraft
A78-47968
SHIDLOVSKII, V. A.
Systems analysis of sympathetic functions
A78-48752
Analysis of the contractility of the myocardium of different heart chambers by means of comparing the isometric contraction of isolated stria and the strain-gage recording of isometric stress of the myocardium of an intact functioning heart
A78-48753
Mathematical model of the contractile activity and the chronotropism of the myocardium
A78-48755
SHIRACHI, D. K.
Head rotational spectral characteristics during two-dimensional smooth pursuit tasks
A78-49263
SHOWALTER, T. W.
A pilot evaluation of two G-seat cueing schemes
[NASA-TP-1255] N78-31739
SIEGEL, B. Z.
Growth of fungi in NaCl-MgSO4 brines
A78-48653
Volcanism and soil mercury on Mars - Consequences for terrestrial microorganisms
A78-48670
SIEGEL, S. M.
Growth of fungi in NaCl-MgSO4 brines
A78-48653
Volcanism and soil mercury on Mars - Consequences for terrestrial microorganisms
A78-48670
Gravity as a biochemical determinant
A78-48671
SIEVERS, A.
Responses of roots to simulated weightlessness on the fast rotating klinostat
A78-48667
SILBERSTEIN, S.
Hazards of organic working fluids
[BMI-50761] N78-31725
SIMMONS, R. E.
Visual workload of the copilot/navigator during terrain flight
[AD-A055038] N78-31742
Methodological considerations of visual workloads of helicopter pilots
N78-31747
SIMMONS, W. S.
Nitrogen oxides: Current status of knowledge
[EPRI-EA-668] N78-31723
SIMONENKOV, A. S.
Human operator in a spacecraft control system during descent in the atmosphere
A78-47970
SIMPSON, J. E.
Spatial disorientation in general aviation accidents
A78-48081
SITTENFIELD, M.
Strong sensitizers
[PB-280475/5] N78-31728
SMIRNOV, V. N.
Mechanisms of self-regulation of the functional system of tracking in normal and pathological states
A78-47979
SMIRNOVA, N. A.
Analysis of the contractility of the myocardium of different heart chambers by means of comparing the isometric contraction of isolated stria and the strain-gage recording of isometric stress of the myocardium of an intact functioning heart
A78-48753
SMITH, P. D.
Variability of oxygen affinity of normal blood - An automated method of measurement
A78-47209
SNOW, T. R.
Substrate effects on myocardial performance during normoxia and hypoxia
A78-47949
SOBICK, V.
Responses of roots to simulated weightlessness on the fast rotating klinostat
A78-48667
SOLIMAN, K. F. A.
Regulation of the adrenal cortex function during stress
[NASA-CR-157397] N78-30808
SOUTENDAM, J.
Instruments and methodology for the assessment of physiological cost of performance of stressful continuous operations: The air traffic services tower environment
N78-31752
SPALDING, J. F.
Late biological effects of ionizing radiation as influenced by dose, dose rate, age at exposure, and genetic sensitivity to neoplastic transformation
[LA-UR-78-681] N78-31724
SPURLOCK, J. M.
Technology requirements for non-terrestrial ecosystems
A78-48666
STAMPAR, A.
Biological significance of some metals as air pollutants. Part 2: Mercury
[PB-279670/4] N78-30814
STARR, G. P.
A comparison of control modes for time delayed remote manipulation
N78-31737
STERLIKOV, A. V.
A method of recording heat parameters of divers during work
N78-31703
STEWARD, F. C.
Is gravity a morphological determinant in plants at the cellular level
A78-48699
STOKES, B. O.
Assessment of free-living nitrogen fixing microorganisms for commercial nitrogen fixation
[NASA-CR-157565] N78-30798
STOLBKOV, IU. K.
Mechanisms of interaction between receptors of the vestibular system
A78-48522
STONE, R. L.
Molecular sieve generation of aviator's oxygen: Breathing gas composition as a function of flow, inlet pressure, and cabin altitude
[AD-A054240] N78-30822
STRASSER, H.
Physiological measures of workloads: Correlations between physiological parameters and operational performance
N78-31753
STRIEB, M. I.
The human operator simulator: Workload estimation using a simulated secondary task
N78-31756
STRZHIZHOVSKII, A. D.
Proliferation of bone marrow cells under the influence of superhigh intensity steady magnetic fields
N78-31707
STUBBS, L.
Illumination-dependent changes in the intrinsic fluorescence of bacteriorhodopsin
A78-48578

STUPPEL, M.
Hypoxia survival variations in male and female mice as functions of chronological and environmental factors
A78-48082

STUPNITSKII, V. P.
Operator activity in a state of continuous wakefulness
A78-47969

SUDOH, M.
Microbiological study of bioecolcgical system. I
A78-47111
Changes of closely related enzymes and minerals to neuro-muscular systems of albinc rats, during prolonged exposure to simulated hypogravics
A78-48645

SUGIMOTO, S.
Method of animal training for biosatellite
A78-47110

SUGITA, Y.
Microbiological study of bioecological system. I
A78-47111

SUTORHIN, V. A.
Visual-motor coordination in the simulation of 10-day reduced gravity
A78-47976

SWENTZEL, K. C.
Toxicological evaluation of Pyrethrins Fogging Concentrate (trade name) study No. 51-1309-78 [AD-A055088]
N78-31715

T

TACKE, H. H.
Electrical enhancement of healing in combat injuries tc hard and soft tissues [AD-A055531]
N78-31718

TAKAGI, S.
Effects of partial body weightlessness on the vestibulc-ocular reflex in man
A78-47112

TAKATA, A. N.
Laser-induced thermal damage of skin [AD-A054612]
N78-30810

TANAKA, H.
Metabolic and thermal responses of men wearing cold-protective clothing to various degrees of cold stress
A78-49298

TAYLOR, W. D.
Distribution of phytoplankton in Tennessee lakes [PB-280139/7]
N78-30803
Distribution of phytoplankton in Ohio lakes [PB-280140/5]
N78-30804

TAYS, M. A.
Preliminary analysis of available inflight respiratory data [AD-A054241]
N78-30823

TERELAK, J.
Sensory deprivation as a problem of prolonged space flights
A78-47484

THEIS, C. F.
Molecular sieve generation of aviator's oxygen: Breathing gas composition as a function of flow, inlet pressure, and cabin altitude [AD-A054240]
N78-30822

THOMAS, C.
A special photoproduct in DNA, UV-irradiated in vacuo
A78-48623

TIETJEN, G. I.
Late biolcgical effects of ionizing radiation as influenced by dose, dcse rate, age at exposure, and genetic sensitivity to neoplastic transformation [LA-UR-78-691]
N78-31724

TIGRANIAN, R. A.
Peculiar characteristics of crewmembers' metabolism on the seccnd expedition abcard orbital station Salyut-4
A78-48080

TIMAKOV, V. D.
Genetics of microorganisms and medicine
N78-31698

TODOROV, E. N.
Studies on adenine acid-soluble nucleotides content in the liver of gamma-irradiated chicken embryos
A78-48442

TORNABENE, T. G.
Phytanyl-glycerol ethers and squalenes in the archaebacterium Methanobacterium thermoautotrophicum
A78-47892

TROPINOV, V. N.
Pilot training and prognosis of psychophysiological conditioning of astronauts
A78-47955
Operator activity in a state of continuous wakefulness
A78-47969

TRUCKENBRODT, A.
Control of a flexible manipulator arm
A78-47541

TSATURIAN, A. K.
Mathematical model of the contractile activity and the chronoinotropism of the myocardium
A78-48755
Modeling of the heart pumping function
A78-48758

TUBEK, Z.
Blood gases at several levels of oxygenation in rats with a left-shifted blood oxygen dissociation curve
A78-50024

U

UNGUREANU, D.
The gastrointestinal tract in hypokinetic rats
A78-48587

USHAKOV, A. S.
Peculiar characteristics of crewmembers' metabolism on the second expedition aboard orbital station Salyut-4
A78-48080

V

VAINSHTEIN, G. V.
Aspects of a systems approach to the analysis of the vascular mechanisms of the brain
A78-48759

VALIC, F.
Biological significance of some metals as air pollutants. Part 2: Mercury [PB-279670/4]
N78-30818

VALLERON, A.-J.
Hypoxia survival variations in male and female mice as functions of chronological and environmental factors
A78-48082

VARTBARONOV, N. A.
Visual work capacity under the action of overloads and elevated temperature
A78-47972

VASILETS, V. N.
Adaptive systems of spacecraft control
A78-47975

VAULINA, E. N.
The action of space flight factors on radiation effects of additional gamma-irradiation of seeds
A78-48611
Biological investigations on the orbital station 'Salyut-5'
A78-48679

VAUTER, D. L.
Elasticity of excised dog lung parenchyma
A78-47206

VERESHCHAGIN, A. F.
Manipulators: Dynamics and algorithms
A78-48525

VERNIKOS-DANELLIS, J.
Serotonin involvement in pituitary-adrenal functicn
A78-48575

VIARD, D.
Choice and analytic techniques involving indices of visual information input. I
A78-46954

VILENCHIK, M. M.
Magnet effects in biology
N78-31709

VILLA, R. F.
Cerebral energy state during or after hypoxia and complete or incomplete ischemia
A78-47210
VILLAUME, J. E.
A literature review: Problem definition studies on selected toxic chemicals. Volume 6: Occupational health and safety and environmental aspects of urea-formaldehyde resins
[AD-A054991] N78-31716
VIZNIUK, A. V.
Analog simulation of the movements of an ideal manipulator
A78-48511
VLADYCHIN, G. P.
Human operator in a spacecraft control system during descent in the atmosphere
A78-47970
VODOLAZSKII, V. L.
Analysis of energy metabolism of a functioning heart during hypoxia and variations of functional loading
A78-48754
VOLKOV, V. G.
Method of evaluating the work capacity of pilots and astronauts
A78-47962
Spaceflight stress factors and the ability to track
A78-47973
VOLOKHOV, V. F.
Suggestibility and characterological features of personality
A78-47961
VOLOSHIN, V. G.
Emotional state and orthostatic reactions
A78-47960
VORONOVA, M. L.
Processes of learning complex behavior
A78-49801
VULETICH, T.
Design and construction of the Donner 280-crystal positron ring for dynamic transverse section emission imaging
[LBL-5679] N78-31721
VYKUKAL, H. C.
Spacesuit mobility joints
[NASA-CASE-ARC-11058-1] N78-31735
Spacesuit torso closure
[NASA-CASE-ARC-11100-1] N78-31736

W

WALLACE, C. J.
Assessment of free-living nitrogen fixing microorganisms for commercial nitrogen fixation
[NASA-CR-157565] N78-30798
WALLACE, T. F.
Spatial disorientation in general aviation accidents
A78-48081
WARD, C. H.
Effects of simulated hypogravity on respiration and photosynthesis of higher plants
A78-48680
WEBBON, B. W.
Spacesuit torso closure
[NASA-CASE-ARC-11100-1] N78-31736
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Genetic code correlations - Amino acids and their anticodon nucleotides
A78-47888
WEISS, L.
Adaptive cardiovascular changes to physical training in spontaneously hypertensive and normotensive rats
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N78-30805
WEST, J. B.
Elasticity of excised dog lung parenchyma
A78-47206
WHERRY, R. J., JR.
The human operator simulator: Workload estimation using a simulated secondary task
N78-31756
WHITEHEAD, G. W.
Study of reactive materials for development of new protective clothing concepts
[AD-A054877] N78-30826
WILLIAMS, L. H.
Distribution of phytoplankton in Tennessee lakes
[PB-280139/7] N78-30803
Distribution of phytoplankton in Ohio lakes
[PB-280140/5] N78-30804
WINGET, C. M.
Loss of circadian rhythmicity in body temperature and locomotor activity following suprachiasmatic lesions in the rat
A78-48576
Effect of suprachiasmatic lesions on diurnal heart rate rhythm in the rat
A78-48580
WINSLOW, R. M.
Variability of oxygen affinity of normal blood - An automated method of measurement
A78-47209
WOESE, C. R.
Archaebacteria
A78-47891
WOLFE, R. S.
Phytanyl-glycerol ethers and squalenes in the archaebacterium Methanobacterium thermoautotrophicum
A78-47892
WONG, S. C. P.
Subjective motion and acceleration induced by the movement of the observer's entire visual field
A78-48824
WOODS, M. L.
An evaluation of the fluidic oxygen partial pressure sensor
[AD-A055362] N78-31743

Y

YUAN, J. S.-C.
Dynamic decoupling of a remote manipulator system
A78-49257
YUNES, A. M.
Hornet building orientation in a vertically rotating centrifuge
A78-48713

Z

ZABRODIN, V. V.
A variant of portable single-channel bioradiotelemetry system
N78-31702
ZANEVELD, L.
Laser-induced thermal damage of skin
[AD-A054612] N78-30810
ZAVALNIUK, V. P.
Pilot training and prognosis of psychophysiological conditioning of astronauts
A78-47955
ZEBOUNI, F.-H.
Inquest after a civil aviation accident - Personal experience
A78-46956
ZEIDIFARD, E.
An assessment of a N2O rebreathing method for the estimation of cardiac output during severe exercise
A78-47492
ZENKEVICH, S. L.
Manipulators: Dynamics and algorithms
A78-48529
ZHABIKOVA, G. G.
Biological investigations on the orbital station 'Salyut-5'
A78-48679
ZHERNAVKOV, V. F.
Adaptive systems of spacecraft control
A78-47975
Detection of terrestrial landmarks during dark adaptation
A78-47984
ZINGERMAN, A. M.
Mechanisms of self-regulation of the functional system of tracking in normal and pathological states
A78-47979

Realignments of the cardiovascular system of a human operator under the action of negative gravity
A78-48760

ZONNENAICH, O.
Atrial flutter - Electrocardiographic, vectorcardiographic and echocardiographic correlation
A78-49150

ZONNENAICH, S.
Atrial flutter - Electrocardiographic, vectorcardiographic and echocardiographic correlation
A78-49150

ZVIAGINTSEV, V. V.
Investigation of the output of the left ventricle of the human heart
A78-48756

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